

16

**The continuum of care  
for maternal, newborn and child health:  
Coverage, co-coverage and equity analysis  
from Demographic and Health Surveys**

**By Katherine J Kerber**

A dissertation submitted to the faculty of Health Sciences at the University of Cape Town, in partial fulfilment of the requirements for the Masters degree in Public Health, August 2007.

**Supervisors:**

Michael Thiede, Health Economics Unit, School of Public Health & Family Medicine, University of Cape Town

Dr Joy Lawn, Saving Newborn Lives/Save the Children US; Institute of Child Health, London; Health Systems Research Unit, Medical Research Council, South Africa

The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

## Table of Contents

---

<b>Declaration .....</b>	<b>iii</b>
<b>Acknowledgements.....</b>	<b>iv</b>
<b>Acronyms .....</b>	<b>v</b>
<b>1. Executive Summary.....</b>	<b>1</b>
<b>2. Introduction.....</b>	<b>3</b>
<b>3. Aim and Objectives .....</b>	<b>4</b>
<b>4. Literature review .....</b>	<b>5</b>
4.1. The concept of the continuum of care.....	5
4.2. The paradigm shift towards a continuum of care .....	6
4.3. The continuum of care: time and place .....	7
4.4. Packaging interventions along the continuum of care.....	9
4.5. Coverage of essential maternal, newborn and child health packages.....	13
4.5.1. Co-coverage of essential interventions.....	14
4.5.2. Assessing quality and effectiveness of care packages.....	14
4.6. Universal coverage in an integrated health system .....	15
4.7. Inequality in health outcomes and services.....	16
4.8. Measuring health inequality .....	17
<b>5. Methods .....</b>	<b>18</b>
5.1. Data inputs from Demographic and Health Surveys .....	18
5.2. Inclusion and exclusion criteria.....	19
5.3. Limitations of Demographic and Health Survey data .....	19
5.4. Variables of interest .....	19
5.5. Data analysis .....	21
<b>6. Results .....</b>	<b>23</b>
6.1. Demographics .....	23
6.2. Coverage of packages along the continuum of care.....	28
6.3. Co-coverage, or joint distribution of packages along the continuum of care .....	32
6.4. Analysis of markers of effective coverage of care .....	35
6.5. Sensitivity analyses .....	37
6.5.1. Children who died before six months of age.....	37
6.5.2. Effect of imputed data using the most recent birth.....	39
6.5.3. Combining postnatal care for home births and facility births .....	39
<b>7. Discussion.....</b>	<b>40</b>
7.1. Overview of results .....	40
7.2. Limitations .....	41
7.3. Patterns of coverage along the continuum of care.....	42
7.4. The gap of postnatal care .....	45
7.5. Missed opportunities to integrate high impact interventions and improve quality.....	45
7.6. Addressing issues of exclusion in scale up.....	47
7.7. Using existing data to strengthen service integration and improve tracking .....	48
<b>8. Further analysis and research questions .....</b>	<b>50</b>
<b>9. Conclusion .....</b>	<b>53</b>
<b>10. References .....</b>	<b>54</b>

<b>Appendix 1: The Wealth Index .....</b>	<b>61</b>
<b>Appendix 2: Stata regression output for Nigeria and Malawi .....</b>	<b>62</b>
<b>Appendix 3: Examples of effective use of data for policy and advocacy .....</b>	<b>66</b>

#### **LIST OF TABLES**

Table 4.1 False dichotomies and common solutions in maternal, newborn and child health .....	7
Table 5.1 Variation in health professional cadres by country.....	20
Table 6.1 Summary data for eight countries and sub-Saharan Africa average.....	26
Table 6.2 Demographic characteristics of mothers and children included in this analysis.....	27
Table 6.3 Summary of coverage along the continuum of care with quintile ratio.....	32
Table 6.4 Summary of co-coverage results, with the median percentage and quintile ratio.....	34
Table 6.5 Markers of coverage of effective care .....	37
Table 6.6 Number and percentage of births that occurred in a health facility and at home.....	37
Table 6.7 Newborn and child deaths under 6 months of age, by household wealth quintile.....	38
Table 6.8 Comparison of antenatal care and skilled attendance linked to mortality.....	38

#### **LIST OF FIGURES**

Figure 4.1 Integrated packages within the continuum of care for maternal, newborn and child health .....	10
Figure 4.2 Missed opportunities in antenatal care in sub-Saharan Africa .....	15
Figure 6.1 Coverage along the continuum of care by country.....	29
Figure 6.2 Average coverage along the continuum of care for eight countries .....	29
Figure 6.3 Distribution of postnatal care by facility and home births .....	29
Figure 6.4 Coverage along the continuum of care by wealth quintile for each country .....	31
Figure 6.5 Co-coverage of those receiving at least one care package, all four packages, and no care .....	33
Figure 6.6 Co-coverage of packages among those receiving at least antenatal care .....	33
Figure 6.7 Percent receiving no care packages and all four packages .....	34
Figure 6.8 Gap between richest and poorest mothers, newborn and children who receive all care packages .....	34
Figure 6.9 Mothers, newborns and children receiving all four packages for five wealth quintiles .....	35
Figure 6.10 (a) Markers of effective antenatal care and immunisation packages in Malawi.....	36
Figure 6.10 (b) Markers of effective antenatal care and immunisation packages in Nigeria.....	36
Figure 7.1 Coverage along the continuum of care with additional package indicators .....	49

#### **LIST OF PANELS**

Panel 4.1 Definitions of the continuum of care for maternal, newborn and child health.....	6
Panel 4.2 Three service delivery approaches for maternal, newborn and child health .....	9
Panel 8.1 Additional research questions raised .....	52
Panel 9.1 What this study adds to current knowledge .....	53

## **Declaration**

---

I, Katherine Kerber, hereby declare that the work on which this dissertation is based is my original work, except where acknowledgments indicate otherwise, and that this work not been submitted for another degree at this or any other university.

Name: .....

Signed: .....

Date: .....

University of Cape Town

## Acknowledgements

---

This research would not be possible without my supervisor, mentor, and friend, Dr Joy Lawn – thank you for sharing with me your passion to speak for those who cannot yet speak out for themselves. Your courage, dedication and love for what you do, and more importantly for those around you, is evident in all you do.

I am very grateful to Prof Michael Thiede of the Health Economics Unit who took me on late in the process and provided insightful inputs and thoughtful guidance.

To my family back in Canada, thank you for all your love and understanding these past few years while we packed up and moved across the world. Your support is invaluable.

Kyle, this is for you.

## Acronyms

---

ANC	Antenatal care
BCG	Bacille Calmette-Guerin vaccine for tuberculosis
DHS	Demographic and Health Surveys
DPT3	Three doses of diphtheria, pertussis and tetanus vaccine
EPI	Expanded Programme on Immunisation
GNI	Gross national income
HMIS	Health and management information systems
IMCI	Integrated Management of Childhood Illness
IPTp	Intermittent preventive treatment in pregnancy for malaria
ITN	Insecticide treated bednets
MICS	Multiple Indicator Cluster Surveys
MNCH	Maternal, newborn and child health
ORS	Oral rehydration salts
PMTCT	Prevention of mother-to-child transmission of HIV
PNC	Postnatal care
STI	Sexually transmitted infections

## 1. Executive Summary

---

The continuum of care for maternal, newborn and child health (MNCH) has recently been highlighted as a systematic approach to integrating health service provision throughout the lifecycle and across levels of service delivery. The continuum provides a framework for delivering high-impact interventions organised in health service packages to deliver high quality reproductive, maternal, newborn and child care services, ensuring appropriate linkages between family and community care, outreach and outpatient services and clinical and the first level facility and the hospital.

This study, using data from Demographic and Health Surveys from eight African countries, provides an analysis of the coverage and co-coverage of four essential MNCH packages along the continuum of care, with a particular focus on inequalities in the distribution of services. The analysis of coverage of antenatal care, skilled attendance at childbirth, postnatal care and immunisation packages reveals key gaps, especially during childbirth and the postnatal period. Coverage is especially low for women and children from the poorest households in these countries, with coverage among the richest quintile up to 6 times higher than the poorest quintile. Nigeria emerges as the country with the lowest coverage overall and the largest gap between rich and poor while Malawi has the highest coverage and the most equitable coverage of services.

Continuity of care between these important packages increases health system efficiency as well as user and provider satisfaction. Co-coverage along the continuum of care was analysed to determine which mothers, newborns and children received all four care packages. While at least three quarters in Nigeria and up to 99% of mothers, newborns and children in Malawi and Tanzania receive at least one package of care, less than half received all four packages. There is greater variation in co-coverage between countries and within countries among the richest and poorest households compared to coverage of single packages alone. The richest quintile in Malawi is twice as likely to receive all four packages compared to the poorest quintile whereas in Nigeria the difference between richest and poorest is 13 fold. The purpose of applying these measures should be seen not as an end in itself but as a tool to describe current patterns and distribution of services and to advance improvements in the continuum of care.



**This research highlights the importance of integrating MNCH packages in different contexts as well as further improvements in data collection in order to effectively guide and monitor progress towards universal coverage of packages along the continuum of care to save the lives of women and children. Addressing issues of exclusion among families from the poorest households and establishing effective links between these packages is crucial to improving overall coverage. The postnatal period in particular is a notable gap that lacks a systematic package in all these countries. In the meantime, available information can be used to improve MNCH integration and service delivery along the continuum of care in order to reach the highest number of women, newborns and children with effective care.**

## 2. Introduction

---

Every year an estimated 529,000 women die from complications related to pregnancy.<sup>1</sup> Additionally, more than 10 million children under five die,<sup>2</sup> and while this number includes four million babies who die before they are one month old,<sup>3</sup> it does not include the four million babies dying in the last trimester of pregnancy.<sup>4;5</sup> Sub-Saharan Africa carries the heaviest burden of maternal, newborn and child death; there is a 1 in 16 lifetime risk of maternal death in sub-Saharan Africa and newborn deaths on the continent account for almost 30% of the global total.<sup>3;6</sup> According to recent analyses in *The Lancet*,<sup>7;8</sup> cost effective, evidence-based interventions and proven health care strategies could prevent up to two-thirds of these newborn and child deaths, and many maternal deaths as well, even in settings of high mortality and weak health systems.

Until recently, there was very little information available on the number and cause of maternal, newborn and child deaths in Africa, especially pertaining to newborns. While there are still some gaps in knowledge, especially in low resource settings and among marginalised populations, increased academic attention to maternal, newborn and child health (MNCH) has improved the quality and availability of data and broadened the evidence base for life-saving solutions.<sup>2;3;9-11</sup> The result has begun a paradigm shift in the way programmes are organised, in the form of the continuum of care for MNCH.<sup>1;12-14</sup>

The continuum of care for MNCH is an approach to integrated health service provision throughout the lifecycle and across levels of service delivery. An effective continuum connects essential MNCH packages, throughout adolescence, pregnancy, childbirth, and the postnatal period, into childhood, while ensuring linkages between family and community care, outreach and outpatient services and clinical and the first level facility and the hospital. Continuity of care is established by ensuring that mothers and their children receive effective services at each level and time period and increases health system efficiency as well as user satisfaction.<sup>15;16</sup> The concept of co-coverage, introduced by Victora et al,<sup>17</sup> provides an opportunity to analyse the joint distribution of health services to determine whether packaged interventions are reaching mothers and children.

Despite policy efforts to strengthen the continuum of care, critical gaps remain and progress towards high coverage is slow in most sub-Saharan African countries. While key packages should reach all mothers, newborns and children,<sup>18</sup> coverage of care is lowest during childbirth and the early postnatal period, the time of highest risk of death for women and newborns.<sup>3;11</sup> Fragmented services and vertical programmes often limit continuity of care between these packages<sup>19</sup> and quality of care during this time may also be at its lowest, and likely lower for those who are poor. Without effective monitoring of progress in scaling up coverage of packages along the continuum of care, efforts to increase interventions could be failing certain segments of the population where the need is the greatest.<sup>20;21</sup>

### **3. Aim and Objectives**

---

The aim of this study is further understand the programmatic implications of the MNCH continuum of care through the assessment of the coverage or utilisation, co-coverage, and markers of effective care of key health service delivery packages along the continuum of care for MNCH and distribution of packages by socioeconomic status in eight African countries using data from recent Demographic and Health Surveys.

The objectives of this research are:

- To measure and describe coverage along the MNCH continuum of care in selected sub-Saharan African countries in terms of utilisation of four service delivery packages of antenatal care, childbirth care, postnatal care, and early childhood care, specifically immunisation services;
- To further analyse co-coverage through time, and markers of effective care in selected packages along the MNCH continuum of care;
- To measure and describe the inequality in patterns of utilisation of maternal, newborn and child health packages in terms of household socioeconomic status in these countries; and
- To discuss how this information can be useful for improving MNCH integration and service delivery along the continuum of care.

## 4. Literature review

---

### 4.1. The concept of the continuum of care

The term “continuum of care” was initially applied in the 1970s to the integration of research and practice in providing continuity of care for the elderly.<sup>22</sup> The term is most often used to refer to individual care and case management, promoting care within a network to ensure the client is not lost to follow up. The majority of the literature is within North American and European health systems. A recent systematic review of the concept of a continuum of care reviewed 638 articles on the topic, published between 1995 and 2002.<sup>16</sup> The majority of these papers were in the nursing literature, including palliative care (58%) and mental health care literature (19%), with some categorized as biomedical medicine (11%) and health service administration (8%). Less than 1% related to public health and health promotion. The common characteristics for a continuum of care were the elements of people, environment, time and events with the central figure being the individual patient or client. This review offered a definition of a continuum of care as “a series of initiating, continuing and concluding care events that result when the patient seeks providers in one or more environments within the health care system.”<sup>16</sup>

The continuum of care has recently been identified in reference to MNCH in international health programme literature.<sup>1;13;14;23</sup> (Panel 4.1) The World Health Organization describes the MNCH continuum as a core principle and framework to underpin strategies for integrated care at a population and health systems level.<sup>1</sup> There has been little reference to the continuum of care for MNCH in peer review literature. In order to identify papers of relevance for the MNCH continuum of care, a search was conducted using the terms “continuum of care,” “continuum,” and “continuity,” and limited to literature from developing countries. 412 articles were identified of relevance, of which 24 were relevant to international public health, most of which dealt with HIV/AIDS and connecting home and hospital care. Only eight articles referred to integrated care for MNCH. All eight articles mentioned the need for a continuum of care though none provided quantitative evidence or analysis of an integrated continuum of care, or addressed policy, programme and information systems to guide the design of a population-level continuum.

---

#### **Panel 4.1 Definitions of the continuum of care for maternal, newborn and child health from programme and peer review literature**

"Programs succeed best when they provide a package of services, including community-based family planning, health and nutrition services. Substantial - and sustained - reduction of the risk of dying once pregnant, however, requires an effective continuum of care from the community to the first-referral level, supported by a public education program."

*World Bank, 1993*<sup>13</sup>

"The right person, at the right time, in the right place, providing the right care."

*Centers for Disease Control/CARE International, 2001.*<sup>24</sup>

"The core principle underlying the strategies to develop MNCH programmes is the 'continuum of care'. This expression has two meanings. First it means care has to be provided as a continuum throughout the lifecycle, including adolescence, pregnancy, childbirth and childhood. Second it indicates that care has to be provided in a seamless continuum that spans the home, the community, the health center and the hospital.

*World Health Organization, 2005*<sup>1</sup>

"The time has come for these health interventions for newborn babies to be integrated into maternal and child health programmes,...The continuum-of-care approach promotes care for mothers and children from pregnancy to delivery, the immediate postnatal period, and childhood, recognising that safe childbirth is critical to the health of both the woman and the newborn child—and that a healthy start in life is an essential step towards a sound childhood and a productive life. Another related continuum is required to link households to hospitals by improving home-based practices, mobilising families to seek the care they need, and increasing access to and quality of care at health facilities."

*The Lancet neonatal series, 2005*<sup>13</sup>

"The household to hospital continuum of care approach provides pragmatic steps to ensure the availability of and access to quality maternal and newborn services at peripheral health facilities and district hospitals, while strengthening linkages in between."

*Save the Children, 2005*<sup>23</sup>

"The continuum of care that follows the life-cycle is part of a high impact program delivery, supported by enabling environment, encompassing strong political commitment and strengthened comprehensive health system, from community level to clinical services."

*Mangiaterra V et al, 2006*<sup>25</sup>

"This encompasses a continuum of essential interventions that should be accessible to mothers, newborns and children at household, community, district and national levels, as well as continuum that follows through the lifecycle of maternal, newborn and child health"

*Partnership for Maternal, Newborn and Child Health, 2006*<sup>26</sup>

---

#### **4.2. The paradigm shift towards a continuum of care**

The integration of MNCH programmes has been described as the start of a paradigm shift in global health from fragmented services towards a continuum of care.<sup>13;27</sup> MNCH programmes and general health system strengthening receives less media attention and international investment than vertical programmes and campaigns.<sup>28</sup> Even within MNCH there has been discord as The Safe Motherhood and Child Survival initiatives of the past twenty years have largely competed for the health of the mother or child, with newborn health missing entirely.<sup>27</sup> The MNCH continuum of care approach represents an alternative to the false

dichotomies of approaches that cater to only mother or children, or one place of service delivery or singular health issue (Table 4.1).<sup>27</sup> This principle is also emerging in global health policy, as international organisations and donors move to support governments through sector wide approaches to planning and funding rather than pursuing separate activities and funding streams. Organisations with previously disparate agendas have come together to form the Partnership for Maternal, Newborn and Child Health in 2005,<sup>29</sup> and a number of African governments, including Tanzania and Nigeria, are combining separate MNCH plans to one national plan.<sup>30</sup>

**Table 4.1 False dichotomies and common solutions in maternal, newborn and child health**

<b>False dichotomies</b>	<b>Common Solutions</b>
Competing voices of advocates for women, newborns and children	<ul style="list-style-type: none"> <li>• Maternal, Newborn and Child Health (MNCH)</li> <li>• Mothers, newborns and children all benefit from essential packages in a continuum of care</li> <li>• Global health policy shift among organisations with disparate agendas coming together to form the Partnership for Maternal, Newborn and Child Health (PMNCH) in 2005</li> </ul>
Facility-based or community care	<ul style="list-style-type: none"> <li>• Systematic, phased health system (including community-based) strengthening with focus on universal coverage of essential MNCH packages, the "diagonal" approach<sup>31</sup></li> </ul>
Vertical or horizontal programming	<ul style="list-style-type: none"> <li>• Integration <i>between</i> essential MNCH packages <i>and with</i> other programmes such as HIV, malaria and vaccine-preventable diseases</li> <li>• Community-based approaches to promote healthy behaviours and demand for skilled care, and to deliver selected essential interventions to under-reached populations, while improving supply and quality of clinical care</li> </ul>
Global tracking or national needs	<ul style="list-style-type: none"> <li>• Tracking for Millennium Development Goals, including mortality, coverage of essential interventions with an equity lens and finances for health</li> <li>• Promoting accountability of governments and partners, results focus</li> <li>• National stewardship with decentralization and district management</li> </ul>
Competing interests of multiple partners, donors and governments	<ul style="list-style-type: none"> <li>• Country-led action with support from donors harmonised to accelerate progress, and broader partner inputs such as professional and non governmental organizations, in the spirit of the Paris Declaration on aid effectiveness<sup>32</sup></li> </ul>

Source: Adapted from reference<sup>7</sup>

### **4.3. The continuum of care: time and place**

According to *Opportunities for Africa's Newborns*,<sup>14</sup> the continuum of care is based on the principle that each contact with the health system provides the opportunity to encourage healthy behaviours and care-seeking in the next time period and at the appropriate level of

care. The authors describe two dimensions of the MNCH continuum – the time when care is provided throughout the lifecycle, and by place or level of care:

**Continuum by time:** The first dimension of the continuum of care involves building on the care provided in the preceding time period, ensuring a more comprehensive health care experience for each woman and child. For example, quality family planning services contribute to a wanted pregnancy at the right time; good care during pregnancy increases the chances of a safe birth; and skilled care at and immediately after birth reduces the risk of death or disability for both the mother and the baby. An effective postnatal care package saves the lives of mothers and babies, and requires continuity in the transition between maternal care and links with preventive and curative care to improve child survival.

**Continuum by place:** The second dimension of an effective continuum of care involves connecting the home and community, the first level facility, and the hospital, ensuring appropriate care is available in the right place and links to the next level of care when needed. The physical location where care is provided varies between health systems, but there are three common approaches for service delivery as described in the *World Development Report 2004*,<sup>33</sup> which differ in terms of transactional intensity and also the obstacles encountered. (Panel 4.2) Darmstadt et al<sup>7</sup> and Lawn et al<sup>10</sup> have emphasised the importance of connecting these approaches through effective referral linkages. Integrating these delivery approaches supports preventive services, healthy behaviours and demand for care as well as appropriate and accessible clinical care. While most health system resources are concentrated at the health facility, it is especially important to ensure services reach families and communities. In many developing countries, most newborn<sup>3</sup> and child<sup>2</sup> deaths, and many maternal<sup>11</sup> deaths occur at home. Thaddeus and Maine<sup>34</sup> have described the delays in reaching care and addressing complications during labour that result not only in deaths, but also in other poor outcomes such as intrapartum stillbirths, newborn illness and disability, obstetric fistula, and other long-term obstetric complications. Long distances, financial constraints, poor communication and transport, and at times, poor quality care in the health facility, limit access to care.

---

#### **Panel 4.2 Three service delivery approaches for maternal, newborn and child health**

**Clinical care** involves individual-oriented case management of mothers, newborns and children with illness or complications, typically provided through facility-based care at primary and referral sites. This care should be available 24 hours a day and providers must be adequately trained, equipped, and supervised. These services, such as emergency obstetric care or integrated management of childhood illness (IMCI), are the most challenging and costly to provide but also have the highest impact in saving lives.

**Outpatient and outreach care** involves population-oriented services, delivered on a periodic basis, either through static clinics (for example routine antenatal or postnatal care) or through mobile services (for example immunisation campaigns or child health days). These services are often standardised with clients receiving the same care, and therefore providers require a skill set that is easier to learn compared to clinical case management.

**Family/community care** involves improving home-based care practices and facilitating the adoption of healthy behaviours, as well as empowering individuals and families to demand quality services. Family/community care should be tailored to the local social and cultural environment, often through formative research. In settings where a cadre of community health workers has been introduced, they require negotiation skills, for example to promote breastfeeding or use of oral rehydration salts, as well as skills to address basic health needs across the lifecycle. For some populations, providing clinical case management in communities is the only way, at least in the short term, to increase access to essential interventions.

Source: Adapted from references<sup>7,33</sup>

---

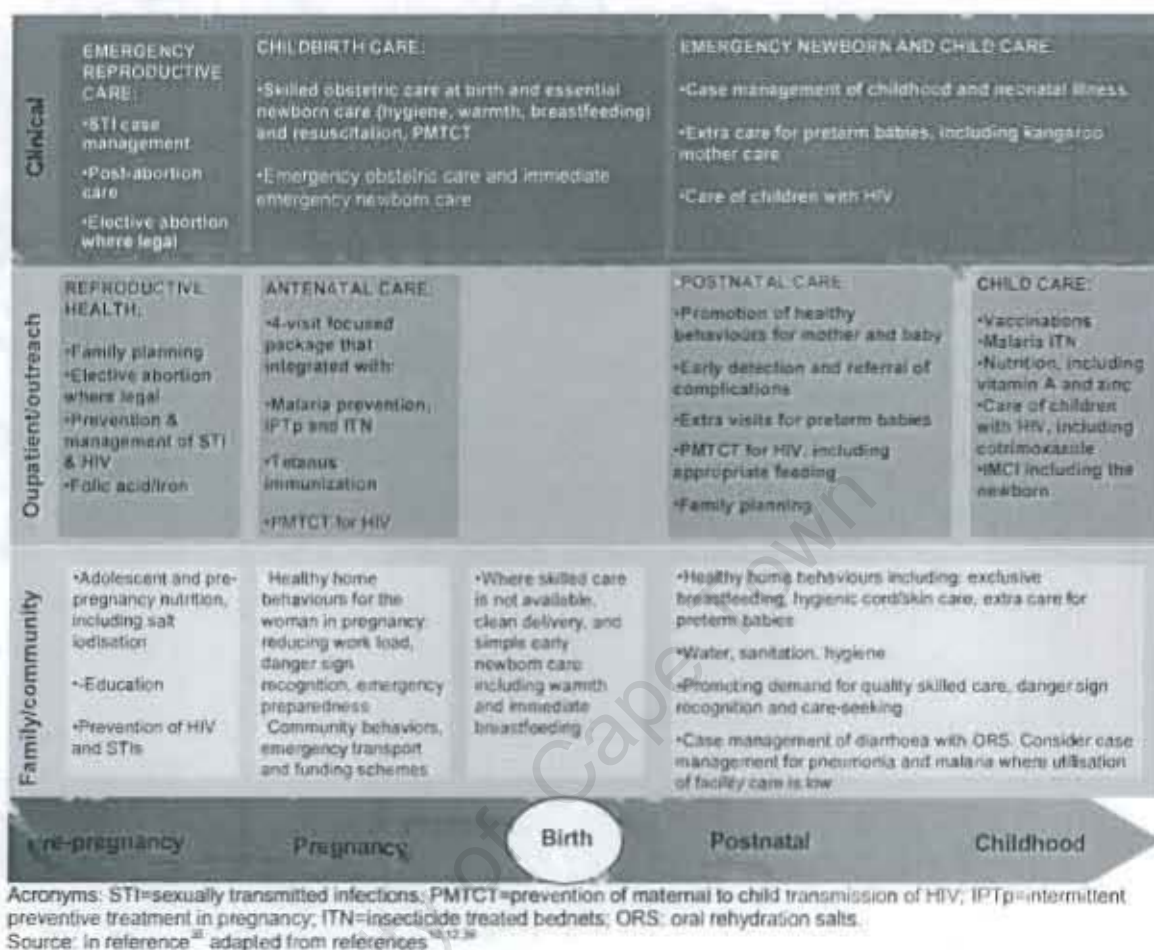
#### **4.4. Packaging interventions along the continuum of care**

The MNCH continuum of care provides a framework whereby single evidence-based interventions can be combined and delivered in packages in accordance with local needs and capacity. Bundling interventions in health packages can enhance cost-effectiveness and suits the reality of limited resources in health systems.<sup>7,18</sup> While packaging interventions should be beneficial, a recent review of studies by Haws et al<sup>19</sup> examining packaged services found that interventions were combined often out of logistical convenience, donor directives, organizational expertise or specific lines of scientific inquiry rather than service delivery approach, biological or behavioural synergies, or cost-effectiveness.

The packages comprising the MNCH continuum of care are organised according to common target populations by time period and common service delivery strategies. **Figure 4.1** illustrates these packages and the evidence-based interventions along the continuum of care. These packages are feasible in low- and middle-income countries, and already exist as part of the health system in most countries, especially during pregnancy and childhood.<sup>7</sup> While these packages should be present in every health system, the content of each package may vary by country and context. **Figure 4.2** describes the current coverage of these packages in sub-Saharan Africa.



**Figure 4.1 Integrated packages within the continuum of care for maternal, newborn and child health and survival**



The eight essential packages in the MNCH continuum of care include three clinical packages (reproductive health, skilled attendance/obstetric care, and care of sick newborns and children), four outpatient/outreach packages (reproductive health, antenatal care, postnatal care and preventive child health services) and an integrated family/community package.

The reproductive health packages delivered through outreach/outpatient and clinical services are closely tied to the education, nutrition, and health services girls and women receive throughout their life. Girls often have limited power to make decisions, including delaying pregnancies and planning for the number and spacing of their children.<sup>12</sup> Effective contraception and family planning is a cost-effective and life saving pre-pregnancy intervention that also improves child health, but is out of reach for many women.<sup>37</sup> Even when reproductive health interventions are delivered through a static facility or outreach visits, poor quality of services may contribute to low utilisation.<sup>38</sup> One study by Pariani et al<sup>39</sup>

from Indonesia found that most women present at family planning clinics having already decided which contraceptive method they want; failure to obtain that method is a major deterrent to adoption and sustained use. In many developing countries, social marketing schemes make commodities more available, yet these schemes tend to be vertically implemented instead of linked to the broader health system.<sup>38</sup> Differences in socioeconomic level are also pronounced in reproductive health. One recent analysis concluded that poor adolescents may be overlooked by current service delivery modes that rely solely on mass media, clinics or schools.<sup>40</sup>

Detection and management of sexually transmitted infections is also critical throughout the lifecycle, for men as well as women. While the majority of reproductive health interventions can be provided through outreach/outpatient services, clinical case management is required particularly for complications of sexually transmitted infections or HIV. The clinical reproductive health package also requires an equipped facility, skilled personnel and availability of safe blood for transfusion for termination of pregnancy services where legal and post-abortion care. According to estimates from Khan et al,<sup>41</sup> unsafe abortion is the fifth most common cause of maternal death globally.

Care for women during pregnancy improves health through prompt detection and treatment of problems and improves pregnancy outcomes. Antenatal care also provides a contact with the health system that can be used to encourage follow up visits and handover to care providers at a different level when required. According to the World Health Organization,<sup>42</sup> effective antenatal care involves a minimum of four antenatal visits at specific times for all pregnant women, which includes evidence based interventions<sup>7</sup> such as screening for and treatment of, conditions such as anaemia, abnormal lie, hypertension, diabetes, syphilis, tuberculosis, and malaria; provision of preventive interventions such as tetanus immunisation and insecticide treated bednets; and counselling about diet, hygiene, HIV status, birth and emergency preparedness, and newborn care and feeding. Antenatal care has relatively high coverage in sub-Saharan African countries which provides a platform for increasing the interventions provided during antenatal visits. However, these opportunities must be weighed against the risk of overloading already stretched services.<sup>43</sup>

Skilled maternal and immediate neonatal care as well as emergency care for maternal, newborn and child illness is facility-based care that should be available around-the-clock at

primary and referral sites to manage acute clinical problems and emergencies. This care requires equipment, drugs, supplies and support such as transport and referral facilities for emergencies.<sup>44</sup> However, each year 18 million African women give birth at home with no skilled care and with weak transport systems to get to a health facility if complications arise.<sup>12</sup> While in most settings skilled attendance during childbirth is strongly correlated with childbirth in a health facility, some settings, such as Indonesia, Bangladesh and the Philippines have taken a community approach to increasing coverage of skilled attendants.<sup>45</sup>

The average coverage of births with a skilled attendant has barely changed in sub-Saharan Africa over the last decade.<sup>6</sup> A series of national surveys in more than twenty African countries show that less than one third of the pregnant women who suffer a life-threatening complication (haemorrhage, eclampsia, obstructed labour, sepsis, unsafe abortion) receive the necessary care.<sup>12</sup> In some cases, even if women live within reach of a health facility they go for antenatal care but not for childbirth, indicating that obstetric care utilisation is much more complex than geographical access alone.<sup>12</sup> Quality skilled care for mother and baby is more than just the presence of a medical professional during childbirth. It includes routine infection prevention practices; monitoring of labour using a partograph; active management of the third stage of labour; hygienic cutting and tying of the cord; resuscitation if needed; essential newborn care (warmth, early and exclusive breastfeeding, and cleanliness); prevention of mother-to-child transmission of HIV (PMTCT); increasing satisfaction and comfort, for example providing privacy, limited vaginal exams, permitting free movement, food and drink intake, and encouraging use of a social companion at birth.

Care for the mother and baby during the six weeks after birth, or the postnatal care package, is crucial for reducing maternal and newborn deaths and can help support the initiation of key healthy behaviours that impact child survival and improve health overall, yet it is the weakest point along the continuum of care. In comparison to detailed implementation guides and large trials for antenatal care, postnatal care has received little attention. However, recent evidence reviews have begun to shape the definition of an effective postnatal package.<sup>7;19;46</sup> Due to the fact that up to half of all newborn deaths occur within the first 24 hours after birth, and three quarters of deaths occur within the first week,<sup>3</sup> and this is also the riskiest time for maternal death,<sup>11</sup> it is essential that women and newborns receive routine visits targeting the high risk first days after birth, especially the first 24 hours, to promote healthy behaviours, identify complications early, and facilitate referral.<sup>47;48</sup>

Clinical care for newborns and children at primary level facilities should be readily accessible, with clear communication and links to the referral level. Care must also be available around-the-clock to manage acute child and newborn illnesses, such as complications of preterm birth and asphyxia, neonatal tetanus or community acquired infections.<sup>3</sup> The clinical care package involves IMCI to improve case management skills of health workers, strengthen the health system, and support families and communities to prevent illness and take better care of sick children.<sup>7</sup>

The child health package delivered through outreach/outpatient services is essential for a number of preventive interventions, including reaching children with immunisations in the first year of life. The World Health Organization's Expanded Programme on Immunisation (EPI) was created to ensure efficient delivery and administration of routine vaccinations for children as well as management of supplies for vaccine-preventable diseases such as tuberculosis, polio, diphtheria, pertussis, tetanus, hepatitis B, measles and yellow fever. Since its inception, EPI has maintained high coverage and low inequality in service provision.<sup>12</sup> While campaigns and vertical immunisation programmes have achieved a level of success resulting in elimination or near elimination of a number of deadly diseases, the challenge now is service delivery integrated into the overall health system and learning from the strategies have worked well for EPI.

The family/community package of services intersects all time periods and is often delivered by one cadre of worker with less training. Recent interest in the family/community package in developing countries, particularly regarding the role of community health workers, has increased the evidence base for this package.<sup>49</sup> Care at the family/community level is focused on improving healthy home behaviours and increasing demand for quality outreach and clinical services.<sup>23</sup> While most clinical care will take place at the health facility, there is mounting evidence that selected complex interventions can be delivered through this package, such as community-based case management of malaria, pneumonia, preterm babies and in some settings, neonatal sepsis case management.<sup>49</sup>

#### **4.5. Coverage of essential maternal, newborn and child health packages**

Monitoring progress for MNCH primarily depends on coverage of key packages, or the proportion of individuals in a target population who need a particular service or intervention

and receive it, measured by utilisation of services.<sup>50</sup> Coverage is measured at the population level for MNCH packages rather than in health facilities or other settings and is most often obtained from household or other demographic surveys. While coverage describes utilisation and often represents the best available data, it does not fully address issues of access to or quality of services.<sup>1;47;51-54</sup> Access has been interpreted as the freedom to use health services and includes availability as well as household and individual aspects such as empowerment to make well-informed decisions about health service use.<sup>55</sup> Specific barriers to seeking and supplying quality MNCH care in Africa have been identified, such as time,<sup>43</sup> direct and opportunity costs,<sup>56</sup> lack of human resources<sup>57</sup> and inadequate supplies.<sup>58</sup> Availability, affordability and acceptability of services all contribute to the quality of interaction between an individual and the health system, leading to broader accessibility of services.<sup>55</sup>

#### **4.5.1. Co-coverage of essential interventions**

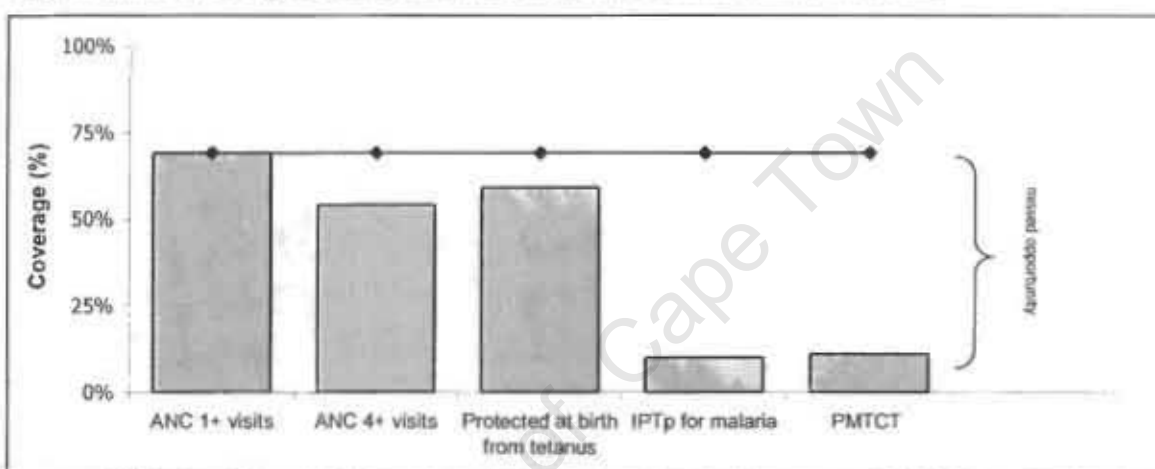
Many programmes, particularly immunisation programmes, involve simultaneous implementation of interventions. Until recently, monitoring utilisation in these programmes has been limited to coverage of single interventions. Victora et al<sup>17</sup> analysed preventive interventions for child survival in order to ascertain how many separate interventions each individual child receives. This individually-linked distribution of interventions was termed co-coverage. Co-coverage analysis can be used to assess which individuals benefit from existing services and how interventions or services are clustered within a setting or a given delivery channel. Existing analyses have focused on single preventive interventions for child health, and have not explored packages of interventions for maternal, newborn and child health that build effectiveness when linked to the care provided in the previous time period. Co-coverage has not yet been applied to the distribution of services where timing of interventions is a factor.

#### **4.5.2. Assessing quality and effectiveness of care packages**

Effectiveness and quality of health care packages is also an important component of services that is broader than a single visit or intervention. Service utilisation rates do not always accurately reflect need for services, or quality of care when services are received. In one analysis of maternal and newborn programme efforts in 49 developing countries, experts rated services to ascertain the effects of programme services on outputs.<sup>59</sup> Components of immunisation and antenatal care packages were comparatively ranked high, while packages emergency obstetric care in rural areas, safe abortion and HIV counselling were low.

Comparing package markers to interventions delivered within those packages can also reveal this gap of ‘missed opportunities’<sup>12</sup> (Figure 4.3). While markers of effective care are well-described and measured for antenatal care and immunisation, less information is available for other packages. For example, the percentage of births with a health professional measures only the presence of an attendant, not the skills used or the enabling environment. In one study from Ghana,<sup>60</sup> an index was developed to capture information on the extent of skilled attendance during childbirth. Researchers found that less than one third of the births attended by a skilled provider met at least three quarters of the quality indicators.

**Figure 4.2 Missed opportunities in antenatal care in sub-Saharan Africa**



Acronyms: ANC=antenatal care; IPTp=intermittent preventive treatment for malaria in pregnancy; PMTCT=prevention of mother to child transmission of HIV (defined as number receiving prophylaxis of those HIV positive)

Source: adapted from reference<sup>12</sup>, data from 20 African Demographic and Health Surveys and UNICEF<sup>61</sup>

#### 4.6. Universal coverage in an integrated health system

Integrated health systems improve coverage and quality of all essential MNCH packages.<sup>18;62</sup> In order to reach high coverage in resource-limited settings, *The Lancet* neonatal series<sup>62</sup> described the need for phased introduction of interventions into integrated health systems packages. As the coverage of essential interventions and quality of service delivery increases and mortality decreases, the cost-effectiveness ratio for more complex interventions changes, making it justifiable and feasible to incorporate more complex interventions into existing packages.<sup>12</sup> However, care packages are not always implemented with the most appropriate mix of cost-effective, evidence based interventions.<sup>19</sup>

While more women, newborns and children are accessing care than any other time in history, coverage is far from universal. Services vary according to geographic location and are

generally sub-standard in rural compared to urban areas. One assessment conducted in Tanzania found twice as many poorly qualified health workers in rural facilities than in urban facilities.<sup>63</sup> While rural services tend to be lower quality, the urban and peri-urban poor are also neglected. The distribution of most health services vary according to socioeconomic level, with coverage of services concentrated among the richest.<sup>64</sup>

Manifestations and patterns of exclusion vary from country to country, but still large portions of the population remain excluded from the health benefits that others in the same country enjoy.<sup>1</sup> Some countries show a pattern of marginal exclusion, where a majority of the population enjoys access to service networks, but substantial numbers of people remain excluded. Other countries experience a pattern of massive deprivation: only a small minority, usually the urban rich has access to health services, while the overwhelming majority is excluded.<sup>1</sup> Health services in countries with massive deprivation are weak and fragmented, and unavailable or inaccessible. Even when families are able to seek care, poorer families are more often provided with care that is ineffective, unresponsive, and expensive.<sup>20</sup> The level of inequality in the distribution of health services has implications for the strategies employed to reach high coverage of health services.<sup>18</sup>

#### **4.7. Inequality in health outcomes and services**

Differences in the health of individuals reflect inherent features of the societies in which they live. Social factors have been identified as the root of much health inequality; poverty, social exclusion, poor health systems and sub-standard housing are among the main causes of ill health.<sup>65</sup> These social determinants of health are relevant to both communicable and non-communicable disease and to adults as well as children.<sup>66</sup> Psychosocial factors, such as a sense of isolation, deprivation or loss of control, are also important causes of ill health.

While absolute poverty has declined in the past two decades, this average improvement is set against unacceptable inequalities both within and between countries. Global analyses show that the poor are consistently disadvantaged in nearly all of the factors that contribute to good health, such as education, knowledge of health matters, nutrition, and use of health services.<sup>67</sup> Eliminating the gap in infant mortality between the rich and the poor in countries could save over 3 million lives, and bringing global mortality rates to the average of the wealthiest countries could save almost 5 million lives.<sup>68</sup> This evidence has resulted in a new Commission on Social Determinants of Health led by the World Health Organization and an



overall recognition by governments, international organisations and donors that equity must be an integral part of health strategies.<sup>20;65;68;69</sup>

One commonly accepted definition of equity in health services is that access to services should correspond to the need for those services, but this is often not the case.<sup>64;70;71</sup> Health services that best approximate this description are those that are less complex to deliver and come with fewer out of pocket costs for users.<sup>12</sup> Health services for pregnant women, newborns and children in particular are designed reach the entire population they serve, but users are consistently concentrated among better-off groups and inequality increases especially when new interventions are introduced.<sup>20</sup> Gwatkin et al<sup>64</sup> have described several techniques which have been effective in certain settings in ensuring that health systems reach disadvantaged groups, which include empowerment and enabling the poorest families to have a more central role in health system design and operation.

The importance of socioeconomic status has been well described in relation to maternal, newborn and child survival,<sup>50</sup> progress towards the Millennium Development Goals,<sup>21</sup> and packaged health services.<sup>17;19</sup> One study from Bangladesh concludes that while essential service packages are helpful to target resources at priority services, numerous barriers to access exist for vulnerable groups.<sup>72</sup> It has been shown that when interventions are offered as a package with a single delivery mechanism, the poorest segment of the population can end up with nothing unless coverage is nearly universal.<sup>18;72</sup> Victora et al<sup>17</sup> found that packaging preventive child survival interventions without adequate equity considerations can result in very disparate coverage between rich and poor.

#### **4.8. Measuring health inequality**

There are a number of ways to measure socioeconomic status and describe the magnitude of social inequalities in health. Mackenbach and Kunst<sup>73</sup> argue for the use of the term inequality in measurement, since inequity, which conveys a “message on the fairness of the differences in health between socioeconomic groups,” cannot be measured directly. Equity in health is a normative concept, implying the need for reduction of health inequalities.<sup>68</sup> Socioeconomic status refers to the relative position of an individual, or household of individuals, in the social hierarchy, expressed using proxy measures of income, occupation, and/or level of education.<sup>73</sup>



Measures of socioeconomic status include wealth indices, measures of occupation, education, household income, or expenditure.<sup>74</sup> A wealth index is arguably the most appropriate indicator for developing country settings where a sizeable proportion of the population is involved in the informal economy.<sup>75;76</sup> Net assets particular to country and regional contexts perform better as a measure of household wealth, and have been shown to be a strong indicator for child health inequities, especially among rural populations.<sup>75;77</sup> Describing the magnitude of socioeconomic equalities can be achieved with a ratio of low compared to high (extreme or broad groups, percentile approach), correlation and regression (regress on socioeconomic status, cumulative percentiles, or z-values), concentration indices including the Gini index, or expressed population attributable risk, or index of dissimilarity.<sup>73;74</sup>

## **5. Methods**

---

### **5.1. Data inputs from Demographic and Health Surveys**

Many developing countries do not have effective vital statistics or regular census-taking and rely on Demographic and Health Surveys (DHS) and other similar population-based surveys, such as Multiple Indicator Cluster Surveys (MICS) for health information. DHS are population-based surveys designed by United States Agency for International Development (USAID) and conducted by ORC Macro. Since 1984, more than 130 nationally representative retrospective surveys have been completed under the DHS project in 70 countries. Each country survey is conducted by local survey organisations with technical assistance in design, sampling, training, fieldwork, data processing, tabulation and report generation provided by ORC Macro. DHS relies on multi-stage sampling procedures, including region of the country, states or provinces, municipalities, census tracts, and households.

The household questionnaire of the DHS collects general household information, such as location, possessions, and local services. Women between the ages of 15 and 49 years, who slept in the dwelling the night before the interview are selected for interviewing with an individual questionnaire. The individual women's questionnaire contains a complete birth history with birth dates, sex, multiplicity of birth, survival status, and age at death if not surviving, for each child. In some countries, a month-by-month reproductive calendar of the preceding 5 years gives information on pregnancies by duration and type of termination. For

each child under 5 years of age, information is collected on prenatal and delivery care, birth weight and size, vaccinations received, feeding and breastfeeding, and morbidity status and treatment. All interviews are conducted face-to-face by trained women interviewers. The quality of the DHS data are among the highest for data on births and infant and child deaths in the developing countries.<sup>78;79</sup>

## **5.2. Inclusion and exclusion criteria**

Thirty-four sub-Saharan African countries have ever conducted a DHS, with twenty-five of these released since 2000. Surveys included in this study required a full DHS completed in 2003 or 2004 with a country-approved and complete dataset. Eight country surveys fit these criteria: Burkina Faso (2003), Cameroon (2004), Ghana (2003), Kenya (2003), Malawi (2003), Mozambique (2003), Nigeria (2003) and Tanzania (2004). The countries with a DHS released during this time that were not chosen for the analysis were Chad, Lesotho, Madagascar, and Mauritania. Reasons for excluding these countries include disputed results (Mauritania), and a lack of a complete dataset at the time of selection (Chad, Lesotho and Madagascar).

## **5.3. Limitations of Demographic and Health Survey data**

While DHS provide some of the most reliable and frequent population-based data for many developing countries, and include rigorous training and built-in as well as random data checks, the surveys do have limitations due to sampling error, reporting and recall bias. The questionnaires collect information based on women's recollection of events during the previous five years. The longer the event occurred in the past, the less likely the woman is to remember whether or not care took place.

## **5.4. Variables of interest**

**Antenatal care:** Antenatal care is measured by DHS as women with a birth in the last five years who received at least one visit from a health professional during pregnancy. The denominator is women who had one or more births in the five years preceding the survey and the numerator is the number of women who received at least one antenatal visit and total number of visits for their last birth distributed according to type of person providing delivery assistance: doctor, nurse/midwife/auxiliary, traditional birth attendant, relative/other, no one. In this study, antenatal care from a doctor and/or nurse/midwife/auxiliary midwife is considered a visit by a health professional, though some countries had additional locally-

defined cadres considered to be health professionals (Table 5.1). Effective coverage of the antenatal care package is assessed using coverage of four visits of antenatal care by health professional.

**Table 5.1 Variation in health professional cadres by country**

Country	Local name of cadre
Burkina Faso	Trained birth attendant (ANC and PNC only)
Cameroon	Aide soignant (health assistant)
Ghana	<i>None identified in DHS</i>
Kenya	<i>None identified in DHS</i>
Malawi	Patient attendant
Mozambique	Enfermeira do SMI (auxiliary nurse)
Nigeria	Community health extension worker (ANC and PNC only)
Tanzania	Assistant Medical Officer, Clinical Officer, Assistant Clinical Officer, maternal and child health aide (ANC and PNC only)

Acronyms: ANC=antenatal care, PNC=postnatal care

Note: Doctors, nurses and nurse midwives are included in the category of 'medically trained' health professionals but some countries have developed new cadres to fulfil this role, as outlined below. The level of training required to provide skilled care also varies in some instances between antenatal, delivery and postnatal care.

Source: Demographic and Health Survey questionnaires and final reports for the eight countries included in the analysis

**Skilled attendance during childbirth:** Critical to care during childbirth is the presence of a skilled attendant. Skilled attendance is measured by DHS as live births attended by a health professional. The denominator is live births to interviewed women who had one or more births in the five years preceding the survey. The numerator is the number of live births distributed according to type of person providing delivery assistance: doctor, nurse/midwife/auxiliary, traditional birth attendant, relative/other, no one. A birth attended by a doctor and/or nurse/midwife/auxiliary is considered by DHS to be a skilled delivery (Table 5.1).

**Postnatal care:** Postnatal care refers to care received by mother and baby during the six week period following birth. The DHS measure used for postnatal care is the distribution of women who receive a postnatal check within two days of delivery distributed according to provider. The population base is women who had a live birth in the five years preceding the survey – separated by facility or home delivery. The questionnaire is based on the assumption that women who give birth in a health care facility receive postnatal care and includes a skip for those women. For this analysis, the assumption is maintained that women who gave birth in a health facility receive postnatal care, however, the limitations of this approach will be discussed. Postnatal care from a doctor and/or nurse/midwife/auxiliary midwife is considered

a visit by a health professional, though some countries had additional locally-defined cadres considered to be health professionals or skilled care (Table 5.1).

**Immunisation package:** The DHS measures the percentage of children who received essential vaccinations, such as three doses of the vaccine for diphtheria, pertussis and tetanus (DPT3), measles vaccine, oral polio vaccine, and the Bacille Calmette-Guerin (BCG) vaccine for tuberculosis. The EPI schedule varies, but all children should have received the third dose of DPT vaccine by 14 weeks of age.<sup>80</sup> The denominator of the DHS indicator is the number of living children up to 59 months of age and the numerator is the number of children receiving the specified vaccines, all specified vaccines, and no specified vaccine, according to information on vaccination card or report by respondent.

**Wealth index:** Wealth indices can be used to assess disparities in specific demographic and health indicators. The wealth index used in the DHS has been tested in a number of countries in relation to inequalities in household income, use of health services, and health outcomes.<sup>75</sup> Asset information is collected in each household questionnaire and covers information on household ownership of a number of consumer items and dwelling characteristics. In the eight countries in this analysis the wealth index was composed of the following variables: ownership of assets such as a radio, television, telephone, refrigerator, bicycle, motorcycle, car/truck, as well as dwelling characteristics such as source of drinking water and time to get to it, type of toilet facility and sole use, electricity, floor material, and type of cooking fuel. Some surveys also used type of wall and roof material. Each asset is assigned a weight generated through principal component analysis, and the resulting scores are standardised. The sample is then divided into quintiles from one (lowest, or poorest) to five (highest, or richest). Individuals are ranked according to the total score of the household in which they resided.<sup>75</sup> (Appendix 1 includes more detail on the DHS wealth index)

### 5.5. Data analysis

National DHS datasets for eight countries that met the inclusion criteria were obtained from ORC Macro and analysed using Stata version 8. Coverage indicators extracted from the women's survey for four packages along the continuum of care were analysed for children up to 59 months of age and their mothers. Up to four births in the past 59 months were included for each woman. There were no more than five women with more than four births in the past five years per country. Household data was merged with individual survey data to apply the

wealth index to each mother and child. Children less than six months of age were excluded from the analysis because vaccinations are sometimes delivered in later infancy, so younger children would not have been in a position to benefit. Children who were not alive at the time of the survey were also excluded from the analysis.

The datasets were analysed to determine coverage of care for four packages at the population level by household wealth quintile. In some countries, data on number of antenatal care visits was only obtained pertaining to the youngest child (65-70% of births). The response for the youngest child was imputed to all the other children up to five years to avoid a large number of missing values for coverage of antenatal care. Any other missing data (less than 1% of observations) were excluded from the analysis.

Adapting methodology proposed by Victora et al,<sup>17</sup> a co-coverage score for all packages was calculated by following the mother/child pair through services received along the continuum of care by time. The score ranges from zero to 4; zero represents no interventions; 1 is antenatal care only; 2 is antenatal care and skilled attendance; 3 is antenatal care, skilled attendance, and postnatal care; 4 is all packages – antenatal care, skilled attendance, postnatal care, and immunisation.

An analysis of effective care was undertaken for the antenatal care package using four visit antenatal care. The marker of effective care for the immunisation package was routine childhood vaccinations, including three doses of DPT, three doses of oral polio vaccine including the dose given at birth, BCG, and the measles vaccine. The routine DHS questionnaire does not include indicators of quality for childbirth care and postnatal care.

Inequality in utilisation of all services relative to wealth quintile was calculated for both coverage and co-coverage. Logistic regression was employed using Stata to analyse the association between wealth quintiles and coverage as well as co-coverage of service utilisation.

## **6. Results**

---

### **6.1. Demographics**

The country datasets meeting inclusion for this analysis are low-income developing nations. Two of the countries are in eastern Africa, two are in the south and four are western African states. All countries have relatively high maternal, neonatal, and child mortality (Table 6.1). Though none of the countries have suffered recent wide-scale disruption from war or natural disasters, all are quite poor, with a gross national income (GNI) per capita ranging from US\$160 to US\$1010. Additionally, all countries have uneven distribution of wealth, with the richest fifth of the population controlling nearly half of all household income.

The data for eight countries capture 50,586 children alive at the time of the survey that were born to 43,239 mothers in the five year period preceding the survey in these countries. This ranges from 3177 mother-child pairs in Ghana to 8700 in Malawi. The age distribution was reasonably uniform across the four age-groups studied, but included fewer infants (children under 12 months) due to exclusion criteria. The majority live in rural areas in each of the eight countries though the proportion varied. For example, in Malawi only 11% lived in urban centres, compared to 40% in Cameroon. Each dataset was divided into quintiles based on household wealth. Due to higher birth rates in the poorest households, the lowest, or poorest, quintile typically included more than 20% (range 18 –33%) of the children, and the highest quintile less than 20% (range 13-22%). Table 6.2 shows the numbers of children available for analysis by sex, age, urban or rural and socioeconomic group. The country breakdown of survey response rates and numbers of women and children included are as follows:

#### **Burkina Faso**

In 9,097 households surveyed, 12,952 eligible women age 15-49 were identified; interviews were completed with 12,477 of these women, yielding a response rate of 96 percent. This included 7,367 women who had at least one birth in the 5 years preceding the survey, and 8,174 children alive at the time of the survey who were included in the analysis.

### **Cameroon**

A total of 10,719 households were selected for the sample, of which 10,462 were successfully interviewed, yielding a household response rate of 98 percent. Of the 466 clusters selected, one could not be surveyed, because it was in a remote northern province. In the households interviewed in the survey, a total of 11,304 eligible women age 15-49 were identified; interviews were completed with 10,656 of these women, yielding a response rate of 94 percent. There were 5,374 women who had at least one birth in the 5 years preceding the survey, and 6,415 children alive at the time of the survey who were included in this analysis.

### **Ghana**

A total of 6,628 households were selected in the sample, and successful interviews were conducted in 6,251 households, yielding a household response rate of 99 percent. In the households interviewed in the survey, a total of 5,949 eligible women age 15-49 were identified; interviews were completed with 5,691 of these women, yielding a response rate of 96 percent. This included 2,777 women who had at least one birth in the 5 years preceding the survey, and 3,133 children alive at the time of the survey who were included in this analysis.

### **Kenya**

A total of 8,889 households were selected for the sample, of which 8,561 were successfully interviewed, yielding a household response rate of 96 percent. In the households interviewed in the survey, a total of 8,717 eligible women age 15-49 were identified; interviews were completed with 8,195 of these women, yielding a response rate of 94 percent. There were 3,972 who had at least one birth in the 5 years preceding the survey, and 4,794 children alive at the time of the survey and included in this analysis.

### **Malawi**

A total of 13,965 households were selected in the sample, and successful interviews were conducted in 13,664 households, yielding a household response rate of 98 percent. The household response rate was higher in rural areas. In the households interviewed in the survey, a total of 12,229 eligible women age 15-49 were identified; interviews were completed with 11,698 of these women, yielding a response rate of 96 percent. There were 7,309 women who had at least one birth in the 5 years preceding the survey, and 8,700 children alive at the time of the survey and included in this analysis.

### **Mozambique**

A total of 12,315 households were successfully interviewed, in which a total of 13,657 eligible women age 15-49 were identified; interviews were completed with 12,418 of these women, yielding a response rate of 91 percent. This includes 7,007 women who had at least one birth in the 5 years preceding the survey, and 7,913 children alive at the time of the survey and included in this analysis.

### **Nigeria**

A total of 7,327 households were selected in the sample, and successful interviews were conducted in 7,225 households, yielding a household response rate of 99 percent. The household response rate was higher in rural areas. In the households interviewed in the survey, a total of 7,985 eligible women age 15-49 were identified; interviews were completed with 11,698 of these women, and interviews were completed with 95% of them. This includes 3,775 women who had at least one birth in the 5 years preceding the survey and 4,453 children alive at the time of the survey and included in this analysis.

### **Tanzania**

A total of 9,852 households were selected for the sample, of which 9,735 were successfully interviewed, yielding a household response rate of 99 percent. In the households interviewed in the survey, a total of 10,611 eligible women age 15-49 were identified; interviews were completed with 10,292 of these women, yielding a response rate of 96 percent. This includes 5,658 women who had at least one birth in the 5 years preceding the survey and 7,004 children alive at the time of the survey and included in this analysis.



Table 6.1 Summary data for eight countries and sub-Saharan Africa average

	Burkina Faso	Cameroon	Ghana	Kenya	Malawi	Mozambique	Nigeria	Tanzania	Sub-Saharan Africa
Geographic region	West	West	West	East	South	South	West	East	
<b>Population</b>									
Total population (2005) <sup>6</sup>	13228000	16322000	22113000	34256000	12884000	19792000	131530000	38329000	713457000
Annual no. of births (2005) <sup>8</sup>	617000	563000	683000	1361000	555000	773000	5377000	1408000	28715000
<b>Mortality</b>									
Maternal mortality ratio per 100,000 live births (2000-2004) <sup>6,9,1</sup>	480	669	540	414	984	408	800	578	940
Under-5 mortality per 1,000 live births (2005) <sup>6</sup>	191	149	112	120	125	145	194	122	169
Neonatal mortality per 1,000 live births (2003-2004) <sup>6,1</sup>	36	40	27	29	40	48	53	43	44
<b>Poverty</b>									
GNI per capita (US\$) (2005) <sup>1</sup>	400	1010	450	530	160	310	560	340	764
% share of household income (1994-2004) <sup>6</sup>	Poorest 40%	18	15	16	13	17	15	19	11
	Richest 20%	47	51	47	49	56	49	42	59

Sources: UNICEF,<sup>6</sup> WHO,<sup>1</sup> Demographic and health surveys<sup>9</sup>

Table 6.2 Demographic characteristics of mothers and children included in this analysis

	Burkina Faso	%	Cameroun	%	Ghana	%	Kenya	%	Malawi	%	Mozambique	%	Nigeria	%	Tanzania	%	Total
Mothers	7367		5374		2777		3972		7309		7007		3775		5658		43239
Children	8174		6415		3133		4704		8700		7913		4453		7004		50586
<b>Sex</b>																	
Girls	3940	48%	3,227	50%	1,559	50%	2,385	50%	4,354	50%	3,987	50%	2,201	49%	3,502	50%	25,154
Boys	4091	50%	3,188	50%	1,574	50%	2,409	50%	4,346	50%	3,926	50%	2,253	51%	3,502	50%	25,289
<b>Age</b>																	
<12 months	1167	14%	918	14%	470	15%	718	15%	1,389	16%	1,168	15%	734	16%	1,022	15%	7,584
13-24 months	1796	22%	1,544	24%	717	23%	1,089	23%	2,183	25%	1,840	23%	976	22%	1,627	23%	11,772
25-36 months	1764	22%	1,371	21%	669	21%	1,032	22%	1,782	20%	1,622	20%	974	22%	1,587	23%	10,781
37-48 months	1893	23%	1,379	21%	708	23%	1,044	22%	1,710	20%	1,815	23%	998	22%	1,465	21%	11,012
49-60 months	1554	19%	1,203	19%	569	18%	911	19%	1,656	19%	1,470	19%	771	17%	1,303	19%	9,437
<b>Location</b>																	
Urban	1399	17%	2,557	40%	869	28%	1,236	26%	961	11%	2,826	36%	1,637	37%	1,222	17%	12,707
Rural	6775	83%	3,858	60%	2264	72%	3558	74%	7738	89%	5087	64%	2816	63%	5782	83%	37,879
<b>Socio-economic status</b>																	
Poorest	1456	18%	1,474	23%	1,045	33%	1,195	25%	1,649	19%	1,770	22%	984	22%	1,543	22%	11,116
Poorer	1690	21%	1,313	20%	688	22%	895	19%	1,958	23%	1,423	18%	918	21%	1,432	20%	10,317
Middle	2130	26%	1,485	23%	538	17%	872	18%	2,069	24%	1,583	20%	885	20%	1,373	20%	10,938
Richer	1490	18%	1,174	18%	454	14%	756	16%	1,740	20%	1,597	20%	878	20%	1,538	22%	9,627
Richest	1408	17%	969	15%	408	13%	1,076	22%	1,284	15%	1,540	19%	785	18%	1,118	16%	8,588

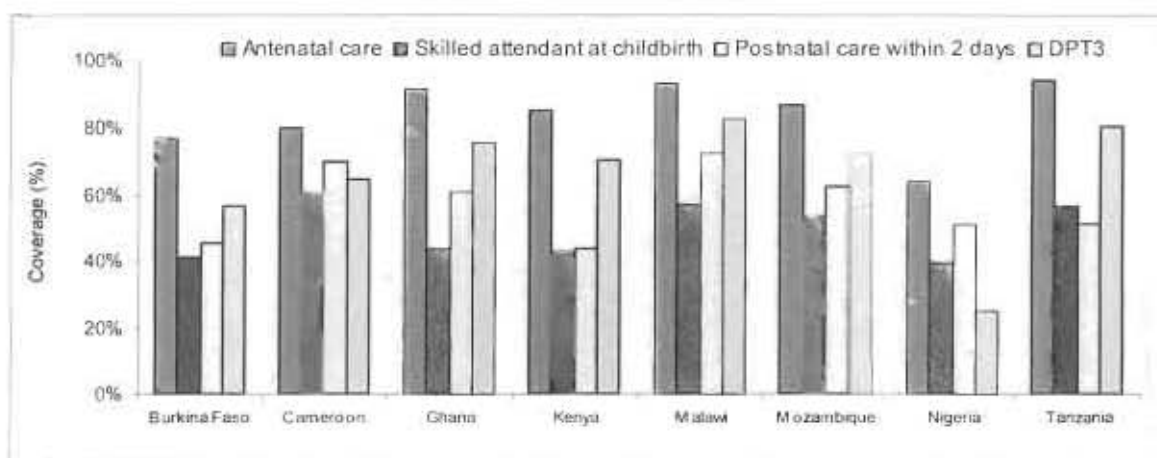
## 6.2. Coverage of packages along the continuum of care

On average, coverage along the continuum of care is higher for the antenatal care package and for immunisation services, but dips considerably for skilled care during delivery and postnatal care (**Figure 6.1**). Nigeria is the only country that does not follow this pattern, and instead begins with the lowest antenatal care coverage of all the eight countries and continues a downward trajectory. Ghana and Tanzania, while experiencing relatively high coverage overall saw the greatest drop-off in care between the antenatal period and skilled delivery. Cameroon and Malawi had the least deviation in coverage between packages. Ghana, Tanzania and Malawi had the highest coverage rates overall, while Nigeria and Burkina Faso did not have coverage levels above 80% for any of the health packages. Cameroon, Malawi, Mozambique and Tanzania had coverage levels above 50% for all four packages.

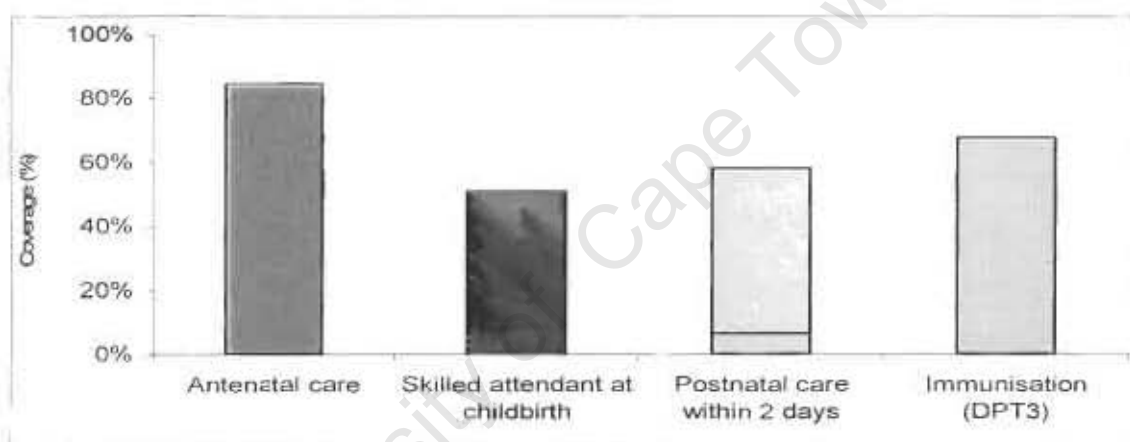
Over 90% of women in Tanzania, Malawi and Ghana report receiving at least one antenatal care visit from a health professional. Care during pregnancy is the lowest was Nigeria, with only 61% percent of women receiving antenatal care. The average for one antenatal care visit for all 8 countries was 84%, substantially higher than the sub-Saharan Africa average of 69% (**Figure 6.2**). Coverage of skilled care during childbirth is exceptionally low overall, but again higher than average in Tanzania and Malawi, both at 57%, and highest in Cameroon, at 61%. Antenatal care coverage was on average 35 percentage points higher than coverage of skilled attendance. The biggest disparity between the first and second packages in the continuum is seen in Ghana, where antenatal care coverage was more than double coverage of skilled care during childbirth.

A postnatal care visit within two days from a health professional was received by 56% of women and their babies. Coverage of postnatal care was highest in Malawi at 72% and lowest in Nigeria at 38%. However, postnatal care was assumed to have been given to women who had births in a health facility and only women whose birth took place at home were asked directly whether they received a postnatal care visit. On average, only 6% of women who gave birth at home, received a postnatal visit within two days. In Ghana, 11% women who delivered at home received a postnatal care visit within 2 days, compared to only 2% of women and babies in Malawi (**Figure 6.3**).

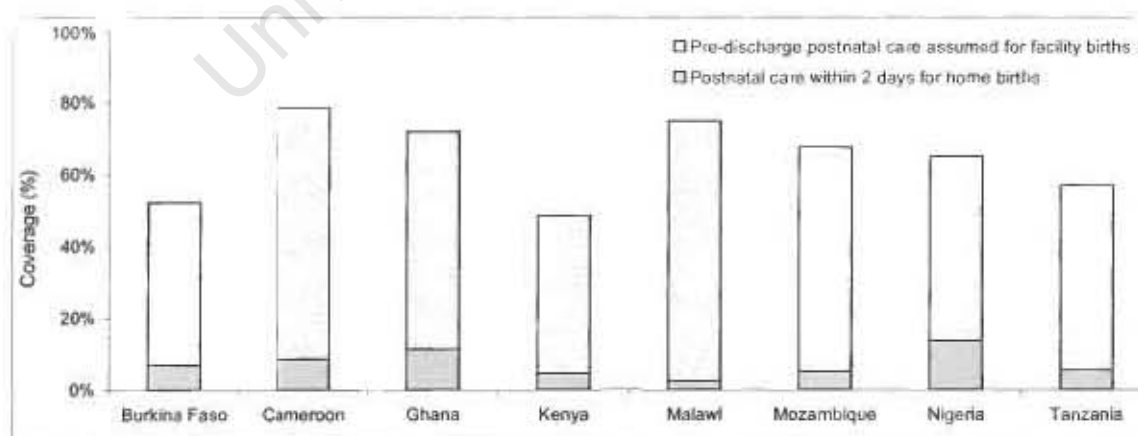
**Figure 6.1 Coverage along the continuum of care by country**



**Figure 6.2 Average coverage along the continuum of care for eight countries**



**Figure 6.3 Distribution of postnatal care by facility and home births**



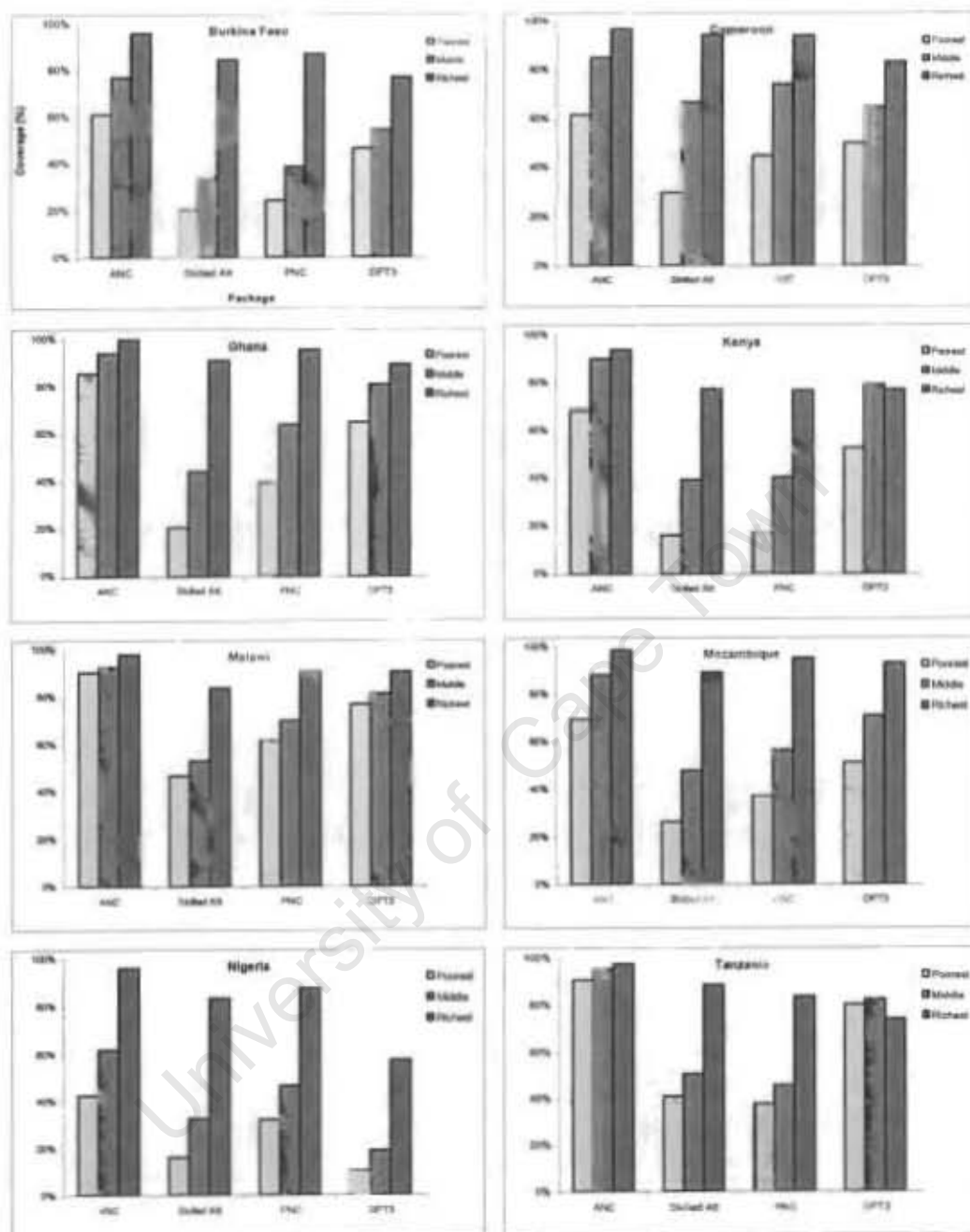
Note: the striped bar represents those women who gave birth at a health facility who were assumed to have received postnatal care. The solid bar represents the proportion of women who gave birth at home who were asked during the interview whether they received postnatal care within 2 days.

Immunisation rates for DPT3 were 67% overall, similar to the sub-Saharan Africa average of 65%. Immunisation rates in Tanzania and Malawi were over 80%. However, less than one fifth of children in Nigeria received this package. All countries except Cameroon and Nigeria saw coverage rise with DPT3 from the skilled care at delivery and postnatal packages, though none managed to attain the same high coverage as seen in antenatal care.

Logistic regression analyses of the proportions receiving each package according to wealth quintiles showed significant association and was most pronounced in Nigeria (Appendix 2 includes Stata output for Malawi and Nigeria). In all countries the richest 20% received on average much higher coverage than the poorest 20% of the population (Figure 6.4, Table 6.3). Coverage is progressive only in Tanzania, and only for one package; immunisation among the richest quintile is 90% of what the poorest receive. Skilled attendance at delivery is the most inequitable package in all 8 countries, where the richest have 4 to 5 times the coverage of the poorest. The exception is Malawi, which has by far the lowest disparity in skilled attendance. Antenatal care is the most equitable package, but the poorest still only receive a range of 37% (Mozambique) and 92% (Tanzania) of the care that the richest do. The disparity in postnatal care between poorest compared to richest ranges from 20% in Kenya to 68% in Malawi and disparity in immunisation ranges from 13% in Nigeria to Tanzania, which actually reports slightly higher immunisation coverage among the poor.

Coverage of care packages in Nigeria is by far the most unequal between rich and poor. Immunisation, which is a relatively equitable package in other countries, was 6 times higher among the richest in Nigeria compared to the poorest. At most the poorest in Nigeria receive 38% of the care received by the richest quintile. Malawi has the most equitable coverage overall, yet the coverage still drops for the poorest compared to the least poor between antenatal care and skilled attendance at delivery. Urban and rural populations revealed less disparity than coverage by wealth quintile, but held similar patterns such as a greater drop-off among after antenatal care for rural populations compared to urban.

Figure 6.4 Coverage along the continuum of care by wealth quintile for each country



Acronyms: ANC=antenatal care, PNC=postnatal care within 2 days, DPT3=three doses of diphtheria, pertussis, tetanus immunisation

**Table 6.3 Summary of coverage along the continuum of care with ratio of coverage in the richest to poorest household quintiles, by country**

	Burkina Faso	Cameroon	Ghana	Kenya	Malawi	Mozambique	Nigeria	Tanzania
Antenatal care	77%	80%	92%	85%	93%	87%	61%	94%
Q5/Q1 ratio (95% CI)	1.59 (1.53-1.65)	1.57 (1.51-1.63)	1.19 (1.16-1.22)	1.37 (1.32-1.42)	1.08 (1.06-1.10)	2.83 (2.46-2.82)	2.27 (2.11-2.45)	1.08 (1.06-1.10)
Skilled attendant	41%	61%	44%	43%	57%	53%	33%	57%
Q5/Q1 ratio (95% CI)	4.23 (3.86-4.64)	3.21 (2.99-3.45)	4.57 (4.07-5.12)	4.89 (4.33-5.53)	1.79 (1.69-1.89)	5.71 (4.88-6.69)	5.24 (4.52-6.07)	2.17 (2.04-2.32)
Postnatal care	45%	70%	61%	44%	72%	62%	35%	49%
Q5/Q1 ratio (95% CI)	3.13 (2.91-3.37)	2.11 (2.01-2.23)	2.49 (2.32-2.68)	3.67 (3.31-4.06)	1.44 (1.38-1.50)	2.56 (2.41-2.72)	2.74 (2.49-3.01)	2.35 (2.18-2.52)
DPT3	57%	65%	76%	71%	82%	72%	21%	80%
Q5/Q1 ratio (95% CI)	1.72 (1.61-1.83)	1.71 (1.61-1.82)	1.42 (1.34-1.51)	1.46 (1.36-1.56)	1.18 (1.14-1.22)	1.82 (1.73-1.90)	5.64 (4.64-6.86)	0.92 (0.88-0.96)

Q5/Q1 ratio refers to the ratio between richest (fifth) and poorest (first) quintiles in terms of proportion of mothers and children receiving the package.

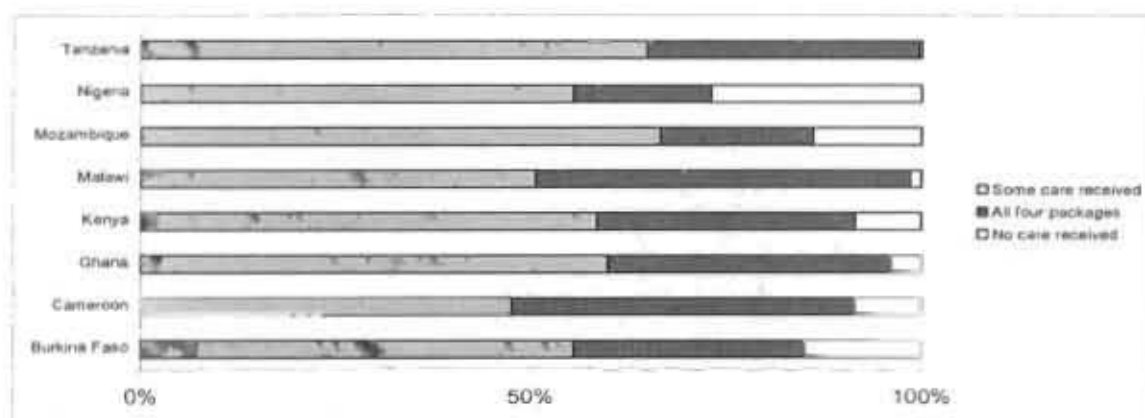
Coverage in all countries varies by wealth quintile, but the disparity is most pronounced in Burkina Faso, Kenya and Nigeria and least in Malawi and Tanzania, with Cameroon, Ghana and Mozambique between the two extremes. Skilled attendance and postnatal is the most unequal, whereas the difference in antenatal care and immunisation coverage for the richest and poorest is less in most of these countries.

### 6.3. Co-coverage, or joint distribution of packages along the continuum of care

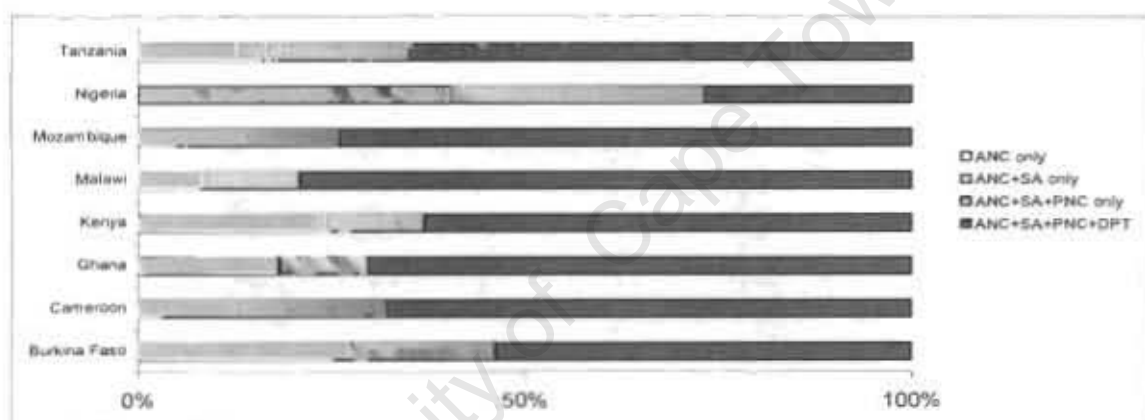
Most women and children received at least some care but the proportion receiving no care at all varied between countries (Figure 6.5). The percentage of all children who did not receive even one care package ranged from less than 1% in Malawi and Tanzania, to 27% in Nigeria. Burkina Faso and Mozambique also had a relatively high proportion of women and children receiving no care at all, at 15% and 14% respectively. However, the majority of mothers who received antenatal care and whose births were attended by skilled personnel also received postnatal care and immunisations. (Figure 6.6) Between 5% (Malawi) and 21% (Nigeria) received antenatal care only, and only 6% (Ghana) and 16% (Nigeria) of mothers and babies received the first three packages only: antenatal care, skilled attendance at childbirth as well as postnatal care. Nigeria had the lowest proportion of those who received all packages, at 14%. Malawi had the highest, with 48% of women and children receiving all four packages of care through immunisation.



**Figure 6.5 Co-coverage of those receiving at least one care package, all four packages, and no care**



**Figure 6.6 Co-coverage of packages among those receiving at least antenatal care**

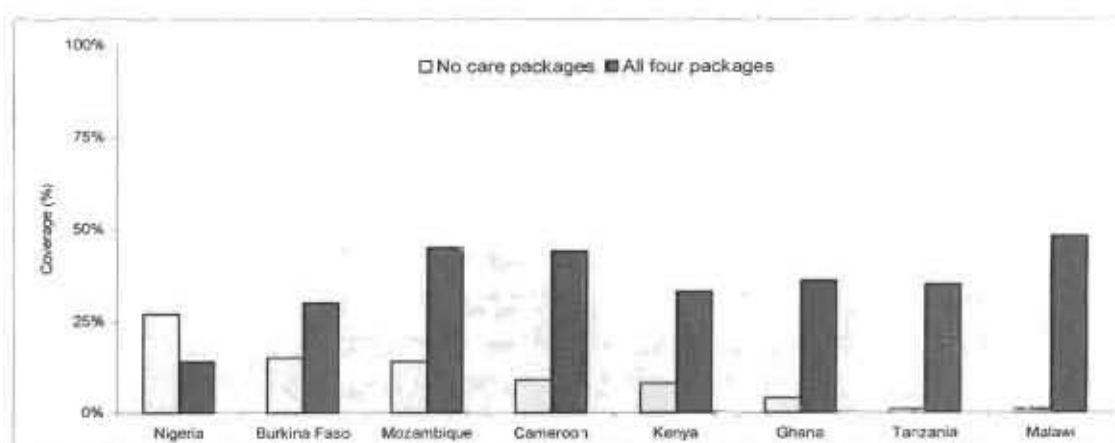


Acronyms: ANC=antenatal care, SA=skilled attendant at birth, PNC=postnatal care within two days, DPT3=three doses of diphtheria, pertussis, tetanus immunisation

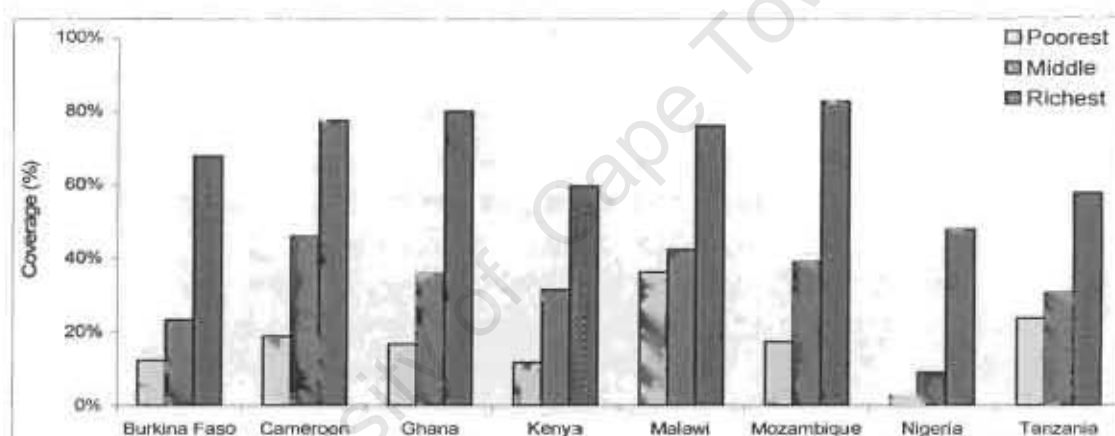
Figure 6.7 shows the distribution of richest and poorest mothers and children who receive all four health care packages, and Figure 6.8 illustrates the disparity in coverage of all packages for the five wealth quintiles. Compared to the coverage of single packages, co-coverage shows even greater disparity among wealth quintiles, with children from the poorest families much less likely to receive all four packages compared to children from the richest families (Table 6.4). This gap was largest in Nigeria, where the richest women and children were 13 times more likely to receive all four packages compared to the poorest families. The disparity in Mozambique was also high: over 80% of the richest quintile received all four packages compared to less than 20% of the poorest. While co-coverage in Malawi was the most equitable, there remains more than a two fold difference between the richest and poorest families.



**Figure 6.7 Percent receiving no care packages and all four packages**



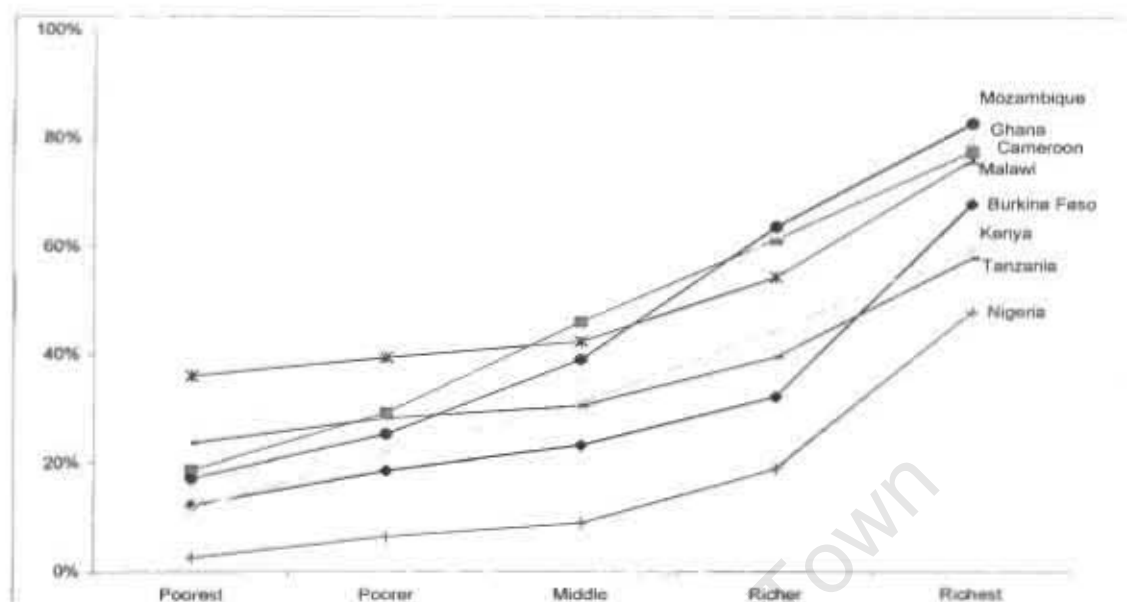
**Figure 6.8 Gap between richest and poorest mothers, newborn and children who receive all care packages**



**Table 6.4 Summary of co-coverage results, with the median percentage and ratio of richest to poorest receiving all four care packages and percentage receiving none of the care packages**

Country	Percent receiving all four packages	Q5/Q1 ratio (95% C.I.)	Percent receiving no care
Burkina Faso	30%	6.17 (5.33-7.14)	15%
Cameroon	44%	4.51 (4.02-5.06)	9%
Ghana	36%	5.13 (4.42-5.95)	4%
Kenya	33%	5.41 (4.58-6.40)	8%
Malawi	48%	2.10 (1.96-2.26)	1%
Mozambique	45%	8.80 (7.16-10.81)	14%
Nigeria	14%	13.35 (9.66-18.45)	27%
Tanzania	35%	2.45 (2.21-2.71)	1%

**Figure 6.9 Distribution of women, newborns and children receiving all four packages for five wealth quintiles**



#### 6.4. Analysis of markers of effective coverage of care

Analysis of the indicators of four key packages within the continuum of care provide an overview but do not assess the quality of a whole package of interventions.<sup>7</sup> For example, one visit of antenatal care measures the first interaction with the health system, but the current recommendation is at least four visits during pregnancy. Similarly, DPT3 measures repeated contacts with the health system during infancy, but there are other important vaccinations included in the package that should be delivered together within the preventive child health care package.

Markers of effective care were assessed using four antenatal care visits and receipt of routine vaccinations: DPT3 as well as BCG, three doses of polio, and measles. The resulting coverage was considerably lower than the primary indicator for the package, and lower among the poor. (Table 6.5) The analysis was done for all countries, but Malawi and Nigeria illustrate the two extremes in coverage of care. (Figure 6.7) In Malawi's graph, there is more difference between the package indicator (ANC1+ and DPT3) and the effective coverage indicator (ANC4+ and all vaccines), but coverage does not vary much between poorest and richest. In Nigeria the coverage for the indicators of the basic and effective package are much closer, but with significant upwards trajectory for the wealthier quintiles.

Figure 6.10 (a) Markers of effective antenatal care and immunisation packages by wealth quintile in Malawi

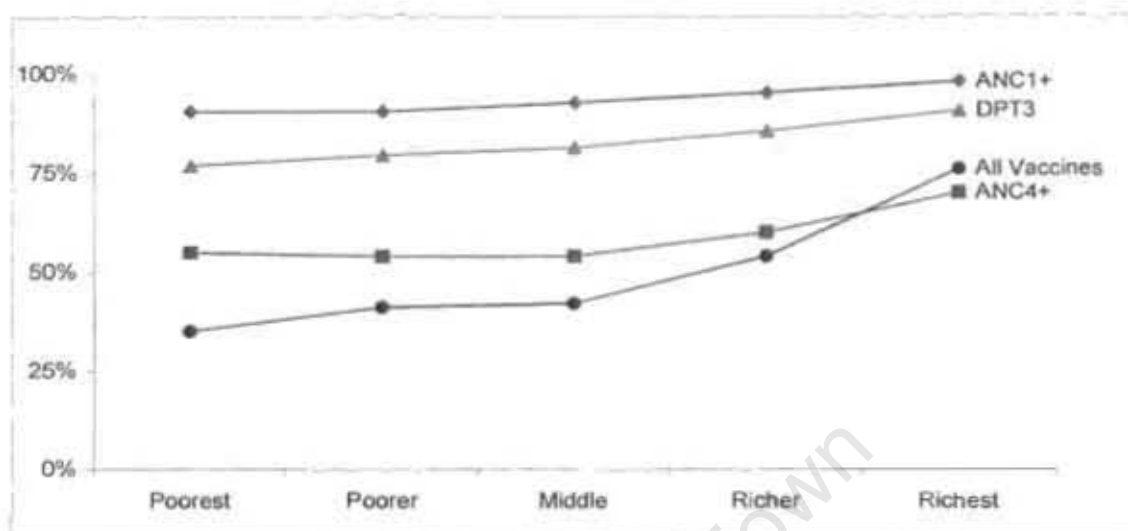
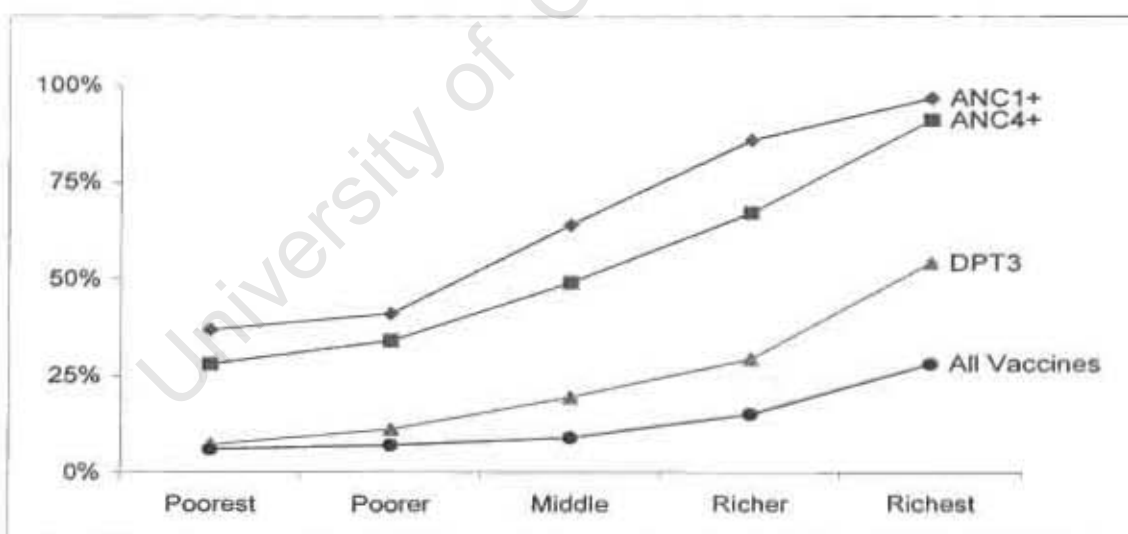


Figure 6.10 (b) Markers of effective antenatal care and immunisation packages by wealth quintile in Nigeria



Acronyms: ANC=one and four visit antenatal care, DPT3=three doses of diphtheria, pertussis, tetanus immunisation

**Table 6.5 Markers of coverage of effective care**

	At least one antenatal visit	Four or more antenatal visits	DPT3 only	All vaccines
Burkina Faso	77%	21%	57%	41%
Cameroon	80%	61%	65%	43%
Ghana	92%	73%	76%	59%
Kenya	85%	56%	71%	46%
Malawi	93%	58%	82%	58%
Mozambique	87%	39%	72%	58%
Nigeria	61%	53%	21%	13%
Tanzania	94%	64%	80%	30%

Fewer indicators are available in DHS to fully describe the coverage of childbirth and postnatal care packages. However, both packages are affected by the location where childbirth occurs. Nearly half (48%) of all births in the eight countries took place outside of a government, mission or private health facility (Table 6.6). The country with the fewest home births was Cameroon (39%), while the most were in Nigeria, where two-thirds of children were born at home. In all countries, at least two thirds of the poorest children are born at home, compared to less than ten percent of children in the richest quintile.

**Table 6.6 Number and percentage of births that occurred in a health facility and at home**

	Number of births that took place in health facility	%	Number of births that took place at home	%
Burkina Faso	3431	42%	4743	58%
Cameroon	3937	61%	2478	39%
Ghana	1844	49%	1589	51%
Kenya	2027	42%	2767	58%
Malawi	6194	71%	2510	29%
Mozambique	4543	57%	3370	43%
Nigeria	1410	32%	3043	68%
Tanzania	3213	46%	3791	54%
Total	26295	52%	24291	48%

## 6.5. Sensitivity analyses

### 6.5.1. Children who died before six months of age

Only children alive at the time of the DHS were included in the analysis, in order to include those who had opportunity to benefit from all the care packages, particularly immunisation services which happen last of all four packages. A significantly higher proportion of the children who died were from the poorest household than the richest households in every

country except Ghana and Kenya. (Table 6.7) Excluding children who died from the analysis favoured the children from richer households, and those who received all essential care packages. The children who died could have had fewer contacts with the health system that could have prevented their deaths. This difference is significant in the countries which also experience more pronounced disparity in coverage by socioeconomic status, that is, Nigeria, Burkina Faso, and but is not excessive between antenatal care and skilled attendant at childbirth among those children alive and not alive at the time of the survey. The exception is again in Nigeria which has much higher antenatal care and skilled attendance coverage among those children still alive at the time of the survey (Table 6.8).

**Table 6.7 Number and percentage of newborn and child deaths under 6 months of age, by household wealth quintile**

	Poorest		Poorer		Middle		Richer		Richest		Q5/Q1 ratio (95% CI)	Total deaths #
	#	%	#	%	#	%	#	%	#	%		
Burkina Faso	271	21%	294	23%	320	25%	838	18%	149	12%	0.62 (0.52-0.75)	1267
Cameroon	235	28%	176	21%	198	24%	296	17%	85	10%	0.59 (0.46-0.74)	838
Ghana	103	35%	69	23%	57	19%	490	13%	30	10%	0.78 (0.53-1.16)	296
Kenya	147	30%	91	19%	84	17%	1041	13%	104	21%	0.80 (0.63-1.02)	490
Malawi	220	21%	261	25%	258	25%	1168	18%	113	11%	0.70 (0.56-0.86)	1041
Mozambique	279	24%	234	20%	258	22%	797	21%	151	13%	0.67 (0.55-0.81)	1168
Nigeria	233	29%	226	28%	162	20%	699	14%	64	8%	0.39 (0.30-0.51)	797
Tanzania	157	22%	168	24%	158	23%	138	20%	78	11%	0.69 (0.53-0.90)	699

**Table 6.8 Comparison of antenatal care and skilled attendance linked to children alive and dead and the time of the survey**

	Coverage of antenatal care			Coverage of skilled attendant at childbirth		
	Child alive	Child dead	RR (95%CI)	Child alive	Child dead	RR (95%CI)
Burkina Faso	76%	69%	1.10 (1.06-1.14)	41%	36%	1.17 (1.08-1.27)
Cameroon	80%	75%	1.06 (1.02-1.10)	60%	53%	1.14 (1.07-1.22)
Ghana	91%	88%	1.03 (0.99-1.07)	43%	41%	1.03 (0.91-1.22)
Kenya	85%	83%	1.03 (0.98-1.07)	43%	40%	1.07 (0.96-1.20)
Malawi	93%	90%	1.04 (1.01-1.06)	57%	51%	1.11 (1.05-1.17)
Mozambique	87%	85%	1.03 (1.00-1.05)	54%	49%	1.10 (1.04-1.18)
Nigeria	63%	49%	1.30 (1.20-1.39)	39%	25%	1.53 (1.34-1.73)
Tanzania	94%	93%	1.01 (0.98-1.04)	57%	57%	1.01 (0.92-1.11)

### **6.5.2. Effect of imputed data using the most recent birth**

While up to five births in the five years preceding the survey were included in the analysis, data for antenatal care visits were only obtained pertaining to the youngest child. The response for the youngest child was imputed to all the other children. The most recent birth accounts for approximately two thirds of the 50,586 total births in the eight countries in this study. In order to validate the imputed data and potential changes in health seeking behaviour after multiple births in a short time period, the same analysis was done using only the most recent birth, finding no differences in coverage or co-coverage for the most recent birth compared to previous births in the five years preceding the survey.

### **6.5.3. Combining postnatal care for home births and facility births**

The limits of postnatal care as an indicator in these and older DHS are well described. Due to the assumptions of the postnatal care indicator, coverage was assessed for each package using only home births. Coverage was substantially lower across all packages. As expected, when split by wealth quintiles home births are strongly correlated with the poorest households. There is not enough difference between household wealth among those who have home births to use the wealth quintile analysis. Without more information on facility births it is difficult to obtain an accurate picture of postnatal care.

While it is not possible at this point to test the assumption in current DHS that all facility births receive postnatal care, recently released DHS from other countries provide additional evidence. Newer DHS, for example, Egypt 2005, Cambodia 2005 and Nepal 2005, did not include the postnatal care assumption in the questionnaire, but rather asked all women whether they and their baby received postnatal care, regardless of place of birth. Postnatal care coverage for facility births is much higher than for home births; over 80% of women who gave birth in facilities received postnatal care within two days in all three of the newer surveys, but still lower than the 100% assumed in older DHS. It is likely that coverage of postnatal care in this study overestimates the reality due to the assumption that all facility births receive postnatal care.

## **7. Discussion**

---

### **7.1. Overview of results**

This study has identified key indicators of four health system packages for maternal, newborn and child health in eight countries based on data from DHS surveys from 2003 and 2004. Coverage of these care packages varies between countries as well as within countries, and is generally much lower among those from the poorest households compared to the richest households. In the eight countries, over 80% of women received antenatal care, and two thirds received DPT3 immunisation, but just over half of all women received childbirth care from a skilled attendant and postnatal care.

Coverage of care in the four packages was also analysed in view of the continuum of care and found that children whose mothers received antenatal care and skilled attendance were much more likely to receive postnatal care and immunisation. There was also greater continuity of care for those who received care before childbirth; with the exception of Nigeria, among the women who received at least antenatal care, over half received all four packages of care. The distribution of health care packages along the continuum is also associated with socioeconomic level, with the richest mothers and children more likely to receive all four care packages compared to the poorest. Countries with higher overall coverage and less inequality within packages maintained better continuity through the four packages.

There were also surprising differences between countries in the proportion who received all care packages and those who received none. Nearly all women, newborns and children in Malawi and Tanzania received at least some care. Higher co-coverage does not necessarily equal inclusive health services. Mozambique and Cameroon, which are similar in co-coverage to Malawi and Tanzania, had the second and third highest proportion of women and children completely excluded from care. While Malawi has the strongest continuity of care, Nigeria had the weakest. In Nigeria 41% of mothers receive only the antenatal care package and only 14% receive all four packages. Over a quarter of women, newborns and children receive not care at all.

Indicators were chosen for this study to represent basic health care package coverage. Markers of effective care such as a four visit antenatal care package and a full immunisation

package of four vaccines were compared with the coverage of basic care packages to determine gaps and potential missed opportunities to provide quality care. The DHS used in this analysis did not record information that can be used as measures of effective care for childbirth and postnatal care, revealing a significant gap in knowledge about the two packages with lowest coverage. Coverage of four-visit antenatal care was much lower in all countries, indicating a potential missed opportunity to provide essential pre-pregnancy interventions that require more than one visit, such as intermittent preventive treatment for malaria. The difference in coverage between the basic immunisation package of DPT3 and all vaccines was actually smaller than the gap between basic and effective antenatal care in most countries, despite the fact that the package of vaccines requires many more visits. The distribution of effective coverage among wealth quintiles was similar to the basic package coverage, revealing increasing coverage among higher wealth quintiles.

The packages in the MNCH continuum of care presented in this analysis are examples of those feasible in low- and middle-income countries, which in fact already exist as part of the health system in most countries, especially during pregnancy and childhood.<sup>7</sup> However, coverage is low and service delivery is often fragmented and weakly implemented, especially during childbirth and the postnatal period, and for the poorest women, newborns and children.

## **7.2. Limitations**

There are several limitations to this study. The primary limitation is the availability of data. The analysis was limited by the number of recent and full datasets. The eight datasets selected represented different regions of sub-Saharan Africa but the results are not necessarily generalisable to the sub-continent.

The data was also limited by the sampling of women and children. Children born to the same mother and living in the same household are not entirely independent of one another for some variables. However, sampling only one child per household would result in under sampling of children living in poor households because of the higher birth rates in these populations. Additionally, the analysis was limited to those children alive at the time of the DHS. In six of the eight countries, a significantly higher proportion of the children who died were from the poorest household than the richest households. Both of these limitations would overestimate



coverage rates because poor households are less likely to receive interventions than more affluent households.

Recall bias could be present, particularly regarding questions pertaining to skilled care. It is possible that some women incorrectly viewed any contact with any health care provider as a contact with a health professional, which would overestimate the true occurrence of skilled care received. Immunisation coverage was based on information either recorded on the vaccination card or reported by the mother or caretaker and therefore could also be subject to recall bias.

Another limitation of the analysis is that while indicators represent the dimension of time and the continuum of care throughout the lifecycle, they don't represent all three service delivery approaches of clinical, outreach/outpatient, and family/community care. Of the eight packages in the MNCH continuum of care, there are fewer, if any, validated, population-based coverage indicators for the two reproductive health packages, the clinical child care package and the family/community package.

The indicators also do not represent full coverage of interventions within existing packages, which was demonstrated by the analysis of effective coverage. However, the two packages with the lowest coverage during the time when most maternal and newborn deaths occur, skilled attendance during childbirth and postnatal care, had no indicators of effective coverage. The definition of postnatal care used in the DHS is also problematic and poses a limitation of this study. The assumption that all women who gave birth at a health facility received a pre-discharge check up for them and their babies likely overestimates the reality due to the assumption that all facility births receive postnatal care. The data could reveal little about follow up visits for babies born in hospitals or at home.

### **7.3. Patterns of coverage along the continuum of care**

Data from the eight DHS in this analysis reflect different contexts and levels of service utilisation. The drop-off between antenatal care and of skilled attendant at birth in these eight countries shows a much larger drop-off than the regional average; from 87% to 51% compared to 69% to 44% on the sub-continent. Of the eight countries, the greatest disparity in coverage between the richest and poorest households is in Nigeria, which also has the lowest coverage rates overall. Malawi has the highest levels of care, as well as the most

equitable coverage. While differences are clear, patterns emerge, such as lower coverage of during childbirth and the early postnatal period. These two packages also had the largest gap between richest and poorest households and a greater drop-off after ANC among the poor than among the rich.

The packages that have the highest coverage – antenatal care and immunisation – are both provided through outreach/outpatient services situated between the community and the health facility. The clinical childbirth package, which is the most costly package for health systems and often for families as well, was the lowest in coverage in every country. While childbirth care provided through clinical services has the highest potential to save lives, it is also the most difficult to access and the most costly for families. Routine postnatal care is also provided through outreach/outpatient services similar in delivery to antenatal care and immunisation, yet coverage of care remains comparable to the much more complex clinical childbirth package.

One benefit of viewing the health system in terms of a continuum is the revelation that care is within reach: a relatively high percentage of pregnant women and children use outreach services. While more than 80% of pregnant women in the eight countries in this analysis receive at least one antenatal care visit, only half receive skilled care at birth and only slightly more women receive a postnatal visit within the crucial first two days after childbirth. Key behaviours starting in the early postnatal period, such as breastfeeding, are also low. Contact with the health system increases once again during early childhood; two-thirds of children receive three doses of DPT vaccine.

The linked packages along the continuum of care also provide an opportunity to connect care and reduce loss to follow up. The co-coverage analysis reveals that among those who entered the health system through antenatal care services, less than a quarter only receive antenatal care; most go on to receive three care additional care packages. However, a number of women, newborns and children are left out of services altogether, and those excluded are more likely to be poor.

While the differences in coverage within countries according to socioeconomic level and between the four packages are staggering there were also marked differences between countries. Tanzania and Malawi in particular stand out with high coverage, lower inequality

and higher continuity of care. While a number of factors may contribute to this situation, there are a few notable examples that could begin to explain why these countries are reaching more mothers, newborns and children with essential care.

Malawi has by far the lowest gross national income per capita of the countries in this study, but had the highest coverage and lowest inequality in the MNCH packages analysed. It is likely that Malawi's relatively small population and geography improves the ability to provide services but there are also tangible ongoing efforts in Malawi to improve MNCH; the participatory Health Sector Reform process has resulted in a national consensus on the essential health package and has resulted in increased health sector investment. There is also high level government commitment to improving MNCH. In Malawi the average donor assistance per child is also among the highest in sub-Saharan Africa.<sup>28</sup>

In Tanzania, the government has shown consistent commitment to invest in MNCH. At the national policy level, Tanzania has multiple strategic plans detailing health sector reform, a road map to maternal and newborn mortality reduction, a plan for increasing districts using IMCI, and a poverty reduction strategy paper.<sup>12</sup> The government has noted the need for one practical operational plan for MNCH that harmonises the existing plans.<sup>30</sup> While providing strong central leadership, decision making for health spending is highly decentralised and based on district priorities. District Health Teams are able to allocate local budgets based on local burden of disease.<sup>12</sup> In particular, there has been recent focus on improving the quality of antenatal care through a four-visit, focused care model.<sup>43</sup>

Conversely, Nigeria has the lowest coverage, high inequality and the lowest continuity of care of the eight countries included in this study. Nigeria, like Tanzania, is highly decentralised, but perhaps lacks strong leadership or planning for health at the national level. Compared to Malawi, the poorest of these countries, Nigeria has a higher gross national income per capita and a higher potential health system capacity including doctors and nurses, but the poorest in Nigeria are still worse off than the poorest in Malawi. The high coverage among the richest in Nigeria demonstrates that the services are available but are not equally or equitably distributed.

#### **7.4. The gap of postnatal care**

Postnatal care in reality is likely to be even lower than reported in this study since pre-discharge checks are not universal in coverage. Even at the levels reported here, postnatal care is a significant missed opportunity for health systems. The current coverage of postnatal care reflects inadequate communication and administrative linkages between maternal and child health services which must intersect during this period, as well as lack of consensus on a minimum package, strategies and the skills mix to deliver postnatal care. Delivery strategies for postnatal care depend on the context, specifically related to the proportion of births that occur at home. If women give birth in a facility, they along with their baby should receive a pre-discharge postnatal visit with an early follow up visit at home and return visits to the facility.<sup>48</sup> Even when births take place in a facility, most women and babies go home within a few hours and returning to the facility in the first few days is unlikely considering lack of transport, cost and cultural constraints.<sup>48</sup> If the birth takes place at home, as is the case for the majority of women in African countries, it is even more unlikely that a trip to the health facility on the first or second day after childbirth will take place.

The current situation in countries should shape the design of postnatal care strategies. For example, in Burkina Faso, 12% children born at home received a postnatal care visit within 2 days, compared to only 2% of women and babies in Malawi. However, in Burkina Faso only 42% of births took place in a health facility, compared to 71% in Malawi. The strategies for scaling up postnatal care in these countries will differ. In Malawi this would involve removing the barriers for the remaining women not currently seeking care at the facility, such as improving quality and availability of services at health facilities, but also increasing the outreach to women who do deliver at home. Burkina Faso requires an immediate solution to improve family/community care at home where most women are giving birth while strengthening services at the health facility and maintaining outreach visits. The higher coverage attained through antenatal care and immunisation services demonstrate that routine care is within reach and can be used as a contact point to increase demand for postnatal care as well as skilled care at childbirth.

#### **7.5. Missed opportunities to integrate high impact interventions and improve quality**

While a systematic postnatal care package is a significant missing link in the continuum of care, many of the packages are missing opportunities to integrate high impact interventions, improve quality and link care. In the analysis of coverage, each package was represented by a

single indicator that signifies some care received from a health care worker – a visit for antenatal care and postnatal care, administration of a vaccine, and care from a health professional during childbirth. Simply looking at these single indicators of the basic package does not guarantee effective care. For example, the package of interventions provided during antenatal care visits is well defined. The analysis of effective care illustrated the discrepancy between one antenatal visit, and the recommended four visits. Even four visits might not necessarily indicate the provision of all interventions such as management of sexually transmitted infections and counselling on birth preparedness as well as malaria prevention and treatment and PMTCT. Similarly, effective coverage of the immunisation package, defined by those children who received all essential vaccinations, was also much lower than the indicator of three doses of DPT.

While the DHS datasets used in this study do not have indicators to demonstrate effective care during childbirth or the early postnatal period, there is evidence to suggest that quality of care is also low at this time.<sup>82;83</sup> Examples of indicators to demonstrate effective care during childbirth have been defined by Hussein et al<sup>60</sup> but are focused mainly on competence to care for the mother. Other possible indicators would include competence of health care providers to care for mother and baby, active management of the third stage of labour, treatment for obstetric and newborn complications, drying and warming the baby immediately after birth, and delayed bathing of the newborn.

Effective postnatal care could be demonstrated by the number of postnatal visits, including extra visits for small babies; currently DHS only captures information pertaining to the first visit. Other indicators of quality postnatal care would be skin-to-skin care, proper cord care, and immediate breastfeeding. In this study the postnatal care provided for facility births is assumed, so it is impossible to know whether a postnatal visit actually took place prior to discharge. In weak health systems and busy hospitals, the quality of this pre-discharge care is likely superficial.

Effective care at high coverage will have far greater impact on survival and overall health, but scaling up each package to contain all interventions does have cost and resource implications. A phased approach to interventions has been proposed<sup>62</sup> whereby each package increases in complexity over time, with additional interventions introduced in a phased manner while reducing mortality and strengthening health system capacity and quality. While

phased introduction of interventions as health system capacity increases will improve efficiency, care must be taken to address coverage within excluded groups.

#### **7.6. Addressing issues of exclusion in scale up**

Equity considerations are important in scaling up coverage along the continuum of care in order to extend coverage in all population groups simultaneously. None of the countries in this study reflect a pattern of massive deprivation, where large parts of the population are deprived of care, even among the better off, on the scale of other sub-Saharan African nations such as Niger or Ethiopia. Neither do they fit a pattern of marginalization where a large part of the population enjoys a wide range of benefits but a minority is excluded.<sup>1</sup> In each of these eight countries, the difference between rich and poor populations is highly pronounced. Unequal distribution and access to various health services may lead to even broader gaps in MNCH needs and outcomes among rich and poor. The risk of further polarization has clear implications for health systems. Unless specific measures are taken to promote universal uptake of services, coverage will go through a phase of increasing inequality.

In this analysis, only one package in one country - immunisation coverage in Tanzania – had coverage of the poorest reaching or exceeding the level of the richest. In all countries, the gap between the richest and poorest for skilled care during childbirth was much higher than the gap between richest and poorest during antenatal care. It is likely that clinical care in general is less equitable than the outreach packages. One possible reason for this unequal distribution of services is the unplanned nature of emergency care seeking and related costs which can make facility-based care more expensive than routine outreach care.<sup>20</sup> Place of childbirth is also strongly linked to socioeconomic status, because wealthier families are able to afford the direct and indirect costs associated with birth in a facility.<sup>59</sup>

The status of health care services in Nigeria in particular should be a focus. Nigeria has the lowest coverage of care among the eight countries in this study and an enormous gap between rich and poor and despite its many resources and higher relative wealth. In addition to low coverage and stagnant progress, the sheer size of Nigeria should make the country a priority. For example, the average for DPT3 for all eight countries in this study was 67%. However, when weighted to account for Nigeria's massive population, the average immunisation coverage drops to 51%. In order to reach global targets, such as the Millennium Development

Goals, progress in Nigeria is essential and the need for strategic solutions and action is urgent.

It is possible that increasing attention to community-based approaches will help address the particular gap between urban and rural populations. Given the distance to health care facilities, rural women and their children are especially disadvantaged in terms of availability of treatment for emergency obstetric conditions<sup>56</sup> and in terms of the quality of care provided.<sup>63</sup> There is also a growing recognition that alternative strategies to mass media, social marketing and clinic programmes, such as community-based approaches must be explored in order to serve the needs of the poorest mothers and their children.<sup>40</sup> National community health worker programmes in Kenya, Ghana, Mozambique and Nigeria, among others, are planned to give workers lifesaving skills for MNCH.<sup>49</sup> While community health workers have the potential to improve outreach packages, in particular postnatal care, demand for clinical care services could increase as well through initiatives to empower families and community to demand better care.

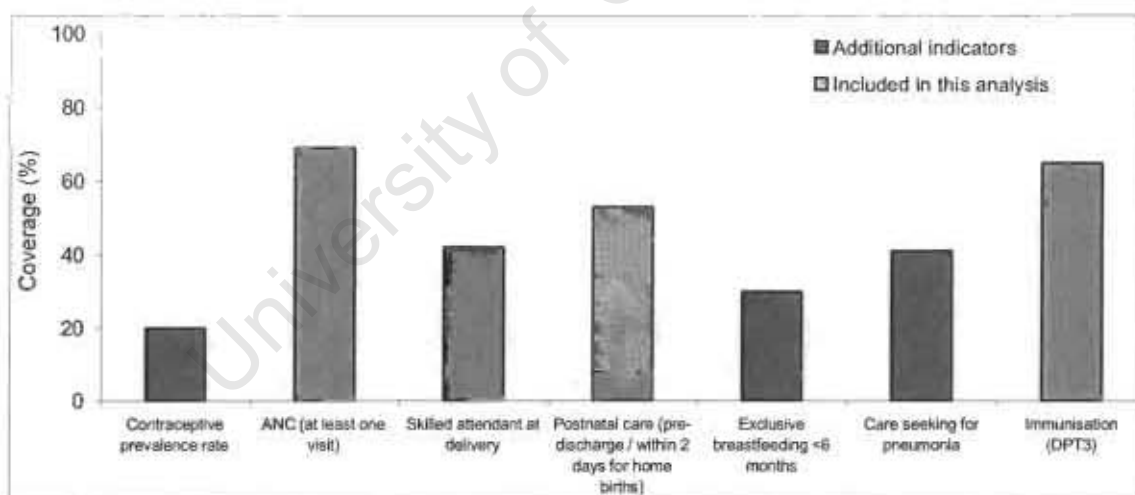
#### **7.7. Using existing data to strengthen service integration and improve tracking**

Existing data can be used more effectively to identify and target populations to reduce inequity with appropriate mechanisms to ensure accountability at national and international levels. Strengthening the continuum of care in practice requires increasing global attention to tracking relevant data and strengthening country-level capacity to use such data to design and improve services, especially at district level, within the continuum of care. Some policy makers and programme managers are not aware of national level data outside of a particular region or programme. One method of presentation and dissemination of information is through country data profiles which include progress and package coverage (Appendix 3 includes examples of country profiles used in *Opportunities for Africa's Newborns*<sup>12</sup> and *Countdown to 2015 Tracking Report*<sup>50</sup>).

A number of MNCH academic and programme experts have collaborated on the *Countdown to 2015* process to provide a monitoring mechanism that will increase the availability of information to help governments and partners strengthen accountability and improve the reach of health services. The indicators used in this analysis to represent continuum of care packages are compatible with the widely used *Countdown to 2015* tracking mechanism,<sup>50</sup> but available data do not adequately reflect the entire continuum, in particular the

family/community package and reproductive health packages. Other indicators have been proposed as possible measures to track coverage along the continuum (Figure 7.1). These include exclusive breastfeeding, which is a healthy behaviour that depends on promotion during antenatal care, interaction at the family/community level and support during postnatal care. In Africa, less than one third of babies younger than 6 months of age are exclusively breastfed. Another family/community behaviour for newborn and child health is care-seeking for children with acute respiratory infection, which is also low at only 35% coverage.<sup>6</sup> There are opportunities to use the higher level of contact with the health care system during pregnancy and childhood to increase quality of these services as well as address the noted gaps of childbirth care and postnatal care.<sup>12</sup> The family/community package can be monitored through demand for services and adoption of healthy behaviours, and in some settings, effective case management of illness at the community level.<sup>49</sup> The reproductive health packages in particular risk falling off the continuum of care. There are few indicators for reproductive health at the population level, representing an important gap.

**Figure 7.1 Coverage along the continuum of care for 25 countries in sub-Saharan Africa with additional package indicators**



Source: Analysis of 25 Demographic and Health Surveys and reference<sup>6</sup>. Countries: Sub Saharan Africa includes Benin, Burkina Faso, Cameroon, Chad, Congo, Eritrea, Ethiopia, Gabon, Ghana, Guinea, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Tanzania, Uganda, Zambia; representing 74% of the region's annual births.

There is an opportunity to further improve the indicators monitored through DHS that can feed back into the monitoring process, but also to use lessons learned to strengthen routine health management information systems (HMIS) and process indicators. Improving HMIS will actually allow for more frequent reporting than the DHS which are only released every



five years, and will also include more elements of quality of care and human resource capacity.

Effective use of information such as coverage along the continuum of care will result in better planning for scaling up services. In all cases, approaches must be tailored to the context. For example, the previously highlighted differences in postnatal care strategies required for Burkina Faso compared to Malawi. Also the extreme inequality seen in Nigeria demonstrates that coverage can be dramatically different within countries; a fact that points to the need for data for decision making at the state and district level. The wealth index has been an important tool in describing differences in socioeconomic status in order to influence policy and increase coverage.

Strengthening the continuum of care requires increasing global attention to tracking relevant data, and increased frequency of key coverage indicators as well as indicators to track and improve quality of care in order to accelerate action to save lives. The purpose of applying measures used in this analysis should be seen not as an end in itself but to describe current patterns and distribution of services and to advance improvements in the continuum of care.

## **8. Further analysis and research questions**

---

The evidence base as well as supportive policy for increasing coverage of integrated MNCH packages already exists in most settings. However, the key gaps in coverage and the unequal distribution of services between rich and poor reveal the need for additional information regarding how to operationalise this integration in practice. This research also raises the need for improving tracking indicators for MNCH as well as using existing data more effectively. The results also suggest to a number of programmatic next steps.

Strong operational management within a health systems context is required to achieve high coverage of basic packages immediately within the MNCH continuum of care and increasing complexity within packages over time. To reach this goal, more effectiveness studies are needed to demonstrate how to integrate MNCH in different settings, informing action and encouraging investment. The cost of scaling up services and phased introduction of

interventions is an important component of planning and priority-setting. Considering the low cost-solutions available to save maternal, newborn and child lives in high mortality settings in particular, cost information is also a useful tool for advocacy.

The drop-off in care during childbirth and the early postnatal period raises the question of how effectively packages are integrated. Low postnatal care in particular links to the lack of a systematically defined and implemented package, as well as a lack of communication in the handover between maternal and child service, resulting in missed opportunities for newborn health in particular. Clear definitions regarding which cadre of health worker can provide care at the different levels and time periods is important and will vary by setting. Evidence is particularly lacking to guide the design of community-based programmes in African contexts but ongoing efforts are adapting and testing lessons learned from Asia and Latin America.

In order to monitor progress, health service packages need better national level indicators for global tracking and better HMIS data at the regional and district level for local tracking, especially for the clinical care packages. Improving the definition of the family/community package as an essential part of the health system will strengthen the ability to track progress. A consensus is needed to improve and validate the indicator for postnatal care in particular, and the current standard of measuring only the first visit. This is equally important if the first visit is represented by a pre-discharge check at the health facility or a visit for the mother and baby when childbirth occurs at home. This process has begun through a revised postnatal care module in DHS surveys, but success will be measured against competing interests to include indicators in an already massive questionnaire as well as the efforts of the international health community to clearly define delivery strategies for postnatal care. Adapting and testing integrated postnatal home visit packages in varying settings, with appropriate cadres and linking referral care, is an urgent research gap.<sup>19</sup>

Co-coverage analysis is relatively new and can provide information on single interventions in one package as well as information on effective integration of services along a continuum of care of linked health packages. As new package indicators are validated, the co-coverage analysis will reveal more about the state of the continuum of care. Considering that the majority of women who received antenatal care also went on to seek care later on, one question raised is whether care-seeking behaviour instilled during antenatal care contributes to the pattern of service utilisation, and to what degree even just one contact with the health

system affects service usage later on. The answers to this question lie in the development of a pregnancy tracking system whereby all pregnant women are followed up through skilled attendance at a facility or through a community outreach mechanism, regardless of whether mother or baby is likely to develop complications.

The large gap in coverage between rich and poor in this research reflects a pattern of inequity beyond inequality. While specific reasons for low utilisation of care among the poor were not addressed in this analysis, it is well known that absence of financial protection against exploitation or catastrophic expenditure coupled with expectations of ill-treatment or discrimination discourage uptake of services.<sup>1</sup> Different solutions are required to improve care for sub-groups within the socioeconomic levels, for example, among the rural and peri-urban poor. Action is needed to address issues of access and empowerment to seek care, not just availability and quality of services.

Inequality in health status should be of concern to policy makers in every sector, not solely those involved in health policy. Underlying causes of ill-health are much wider than the health sector; for example education and empowerment particularly for women, and improved transport systems substantially benefit MNCH. Additional research and investment is required to improve all facets of the continuum of care for MNCH and to expand it to reach all mothers, newborns and children.

---

#### **Panel 8.1 Additional research questions raised**

##### **Further analysis of coverage**

- Progress and trends in increasing coverage across different socioeconomic levels
- Differences in utilisation of health services among sub-groups, such as urban and rural poor
- Adapting co-coverage analysis to evaluate measures of quality and effective care
- Identifying colinearity of socio-economic status and urban/rural and inter-sectoral determinants of MNCH

##### **Improving the input data**

- Defining quality and effective care within packages and associated indicators
- Validation of new indicators, including immediate and early postnatal care

##### **Programmatic research**

- Determinants of access and care-seeking behaviour and drop off between antenatal and childbirth care
  - Effectiveness of integrating MNCH in different settings
  - Operational linkages between service delivery approaches and use of different cadres
  - Effective packaging and phasing interventions, including cost of scaling up
-

## 9. Conclusion

When implemented vertically or merely out of convenience, packages can be inequitable,<sup>17</sup> fragmented<sup>72</sup> and incomplete.<sup>19</sup> However, integrated care along the continuum through the lifecycle and at the place where care is provided contributes to health system efficiency but also increased user and provider satisfaction.<sup>15,16</sup> This analysis of coverage of key packages along the continuum of care illustrates that some services are reaching higher coverage with less inequity, yet there is a gap along the continuum of care corresponding to the time of greatest risk for mothers, newborns and children.<sup>6,12</sup> Existing population-based data can help identify gaps in the continuum of care but there are key indicators missing in order to get a clear picture of coverage and co-coverage of packages. There is a need for significant improvement in integrating MNCH along the continuum of care especially in terms of reaching the poorest with essential services to save the lives of Africa's mothers, newborns and children.

### Panel 9.1 What this study adds to current knowledge

#### What is already known on this topic

- The continuum of care provides a framework for integrated maternal, newborn and child health services with integrated service delivery packages
- Health service packages involve interventions implemented as a package that can increase health system efficiency and user satisfaction
- Coverage of essential care for mothers, newborns and children is low in sub-Saharan Africa
- Utilisation of health care services varies according to socioeconomic level
- Co-coverage analysis can be used to assess how preventive child survival interventions are clustered at the level of the individual child

#### What this study adds

- Coverage along the continuum of care follows a pattern that is high during antenatal care and childhood, but drops at the time of childbirth and the postnatal period
- Postnatal care is a particular gap, lacking an effective delivery strategy in most settings that is compounded by poor monitoring
- Co-coverage can be used to assess how a package of interventions links to another during a different time period along the continuum of care
- Coverage and co-coverage patterns differ between countries in sub-Saharan Africa but also within countries, with the poor receiving far fewer services than the rich
- Effective coverage is low. Population level data on quality and effective care is lacking for childbirth and postnatal care
- Analysis of coverage, co-coverage and equity along the continuum of care provides an opportunity to address fragmented health system packages and better understand patterns of exclusion

## 10. References

---

### Demographic and Health Surveys used in this analysis

Burkina Faso Enquête Démographique et de Santé. 2003. Institut National de la Statistique et de la Demographie, Ministère de l'économie et du Développement, Ouagadougou, Burkina Faso, and ORC Macro, Calverton, Maryland, USA.

Cameroun Enquête Démographique et de Santé. 2004. Institut National de la Statistique Ministère de la Planification, de la Programmation du Développement et de l'Amenagement du Territoire Yaounde, Cameroun and ORC Macro Calverton, Maryland USA.

Ghana Demographic and Health Survey. 2003. Ghana Statistical Service, Accra, Ghana, Noguchi Memorial Institute for Medical Research, Legon, Ghana, and ORC Macro, Calverton, Maryland, USA.

Kenya Demographic and Health Survey. 2003. Central Bureau of Statistics, Ministry of Health, Kenya Medical Research Institute, National Council for Population and Development, Centers for Disease Control and Prevention, Nairobi, Kenya and ORC Macro, Calverton, Maryland, USA.

Malawi Demographic and Health Survey. 2004. National Statistical Office Zomba, Malawi and ORC Macro Calverton, Maryland, USA.

Moçambique Inquérito Demográfico e de Saúde. 2003. Instituto Nacional de Estatística and Ministerio da Saúde and ORC Macro Calverton, Maryland, USA.

Nigeria Demographic and Health Survey. 2003. National Population Commission Federal Republic of Nigeria and ORC Macro Calverton, Maryland, USA.

Tanzania Demographic and Health Survey. 2004. National Bureau of Statistics Dar es Salaam, Tanzania, United Republic of Tanzania, ORC Macro Calverton, Maryland, USA.

### Reference List

- (1) WHO. World Health Report 2005: make every mother and child count. 2005. Geneva, Switzerland, World Health Organization.
- (2) Black RE, Morris SS, Bryce J. Where and why are 10 million children dying every year? *Lancet* 2003; 361:2226-2234.
- (3) Lawn JE, Cousens S, Zupan J. 4 million neonatal deaths: when? Where? Why? *Lancet* 2005; 365:891-900.
- (4) Lawn J, Shibuya K, Stein C. No cry at birth: global estimates of intrapartum stillbirths and intrapartum-related neonatal deaths. *Bull World Health Organ* 2005; 83(6):409-417.

- (5) Stanton C, Lawn JE, Rahman H, Wilczynska-Ketende K, Hill K. Stillbirth rates: delivering estimates in 190 countries. *Lancet* 2006; 367:487-1494.
- (6) UNICEF. State of the World's Children 2007. 2006. New York, United Nations Children's Fund (UNICEF).
- (7) Darmstadt GL, Bhutta ZA, Cousens S, Adam T, Walker N, De Bernis L. Evidence-based, cost-effective interventions: how many newborn babies can we save? *Lancet* 2005; 365:977-988.
- (8) Jones G, Steketee RW, Black RE, Bhutta ZA, Morris SS. How many child deaths can we prevent this year? *Lancet* 2003; 362:65-71.
- (9) Lawn JE, Wilczynska-Ketende K, Cousens SN. Estimating the causes of 4 million neonatal deaths in the year 2000. *Int J Epidemiol* 2006; 35(3):706-718.
- (10) Lawn JE, Zupan J, Begkoyian G, Knippenberg R. Newborn Survival. In: Jamison D, Measham A, editors. *Disease Control Priorities*. 2 ed. Washington DC. Oxford University Press, 2006. pp.531-549.
- (11) Ronsmans C, Graham WJ. Maternal mortality: who, when, where, and why. *Lancet* 2006; 368:1189-1200.
- (12) Lawn J, Kerber K, eds. *Opportunities for Africa's Newborns: practical data, policy and programmatic support for newborn care in Africa*. Cape Town, Partnership for Maternal, Newborn and Child Health; 2006.
- (13) Tinker A, Hooper-Bender P, Azfar S, Bustreo F, Bell R. A continuum of care to save newborn lives. *Lancet* 2005; 365:822-825.
- (14) de Graft-Johnson J, Kerber K, Tinker A, Otchere S, Narayanan I, Shoo R et al. The maternal, newborn and child health continuum of care. In: Lawn J, Kerber K, editors. *Opportunities for Africa's Newborns*. Cape Town: Partnership for Maternal, Newborn & Child Health; 2006. pp.23-36.
- (15) Bryce J, Black RE, Walker N, Bhutta ZA, Lawn JE, Steketee RW. Can the world afford to save the lives of 6 million children each year? *Lancet* 2005; 365:2193-2200.
- (16) Bryde-Foster M, Allen T. The continuum of care: a concept development study. *J Adv Nurs* 2005; 50(6):624-632.
- (17) Victora CG, Fenn B, Bryce J, Kirkwood BR. Co-coverage of preventive interventions and implications for child-survival strategies: evidence from national surveys. *Lancet* 2005; 366:1460-1466.
- (18) Victora CG, Hanson K, Bryce J, Vaughan JP. Achieving universal coverage with health interventions. *Lancet* 2004; 364:1541-1548.
- (19) Haws RA, Thomas AL, Bhutta ZA, Darmstadt GL. Impact of packaged interventions on neonatal health: a review of the evidence. *Health Policy Plan* 2007.

- (20) Victora CG, Wagstaff A, Schellenberg JA, Gwatkin D, Claeson M, Habicht JP. Applying an equity lens to child health and mortality: more of the same is not enough. *Lancet* 2003; 362:233-241.
- (21) Wirth ME, Balk D, Delamonica E, Storeygard A, Sacks E, Minujin A. Setting the stage for equity-sensitive monitoring of the maternal and child health Millennium Development Goals. *Bull World Health Organ* 2006; 84(7):519-527.
- (22) Liebowitz B, Brody EM. Integration of research and practice in creating a continuum of care for the elderly. *Gerontologist* 1970; 10(1):11-17.
- (23) Otchere S, Ransom E. Bringing Care Closer to Mothers and Newborns: Using the Gap Analysis Tool to Develop a Household to Hospital Continuum of Care. Washington, DC: Save the Children, 2005.
- (24) Lawn JE, McCarthy B, Ross SR. The Healthy newborn: A reference guide for program managers. Atlanta, Georgia: CDC and CARE, 2001.
- (25) Mangiattera V, Mattero M, Dunkelberg E. Why and how to invest in neonatal health. *Semin Fetal Neonatal Med* 2006; 11(1):37-47.
- (26) PMNCH. Conceptual and institutional framework. 2007.  
<http://www.who.int/pmnch/activities/cif/conceptualandinstframework.pdf> (accessed 6 June 2007).
- (27) Lawn JE, Tinker A, Munjanja SP, Cousens S. Where is maternal and child health now? *Lancet* 2006; 368:1474-1477.
- (28) Powell-Jackson T, Borghi J, Mueller DH, Patouillard E, Mills A. Countdown to 2015: tracking donor assistance to maternal, newborn, and child health. *Lancet* 2006; 368:1077-1087.
- (29) Lawn JE, Cousens SN, Darmstadt GL, Bhutta ZA, Martines J, Paul V et al. 1 year after The Lancet Neonatal Survival Series--was the call for action heard? *Lancet* 2006; 367:1541-1547.
- (30) The Partners' Forum Meeting Report. Dar es Salaam, Tanzania. 17-20 April 2007; 2007.
- (31) Sepulveda J, Bustreo F, Tapia R, Rivera J, Lozano R, Olaiz G et al. Improvement of child survival in Mexico: the diagonal approach. *Lancet* 2006; 368:2017-2027.
- (32) OECD. The Paris Declaration on Aid Effectiveness. 2005.  
<http://www1.worldbank.org/harmonization/Paris/finalparisdeclaration.pdf> (Accessed 6 June 2007)
- (33) World Bank. The World Development Report 2004: making services work for poor people. 2003.
- (34) Thaddeus S, Maine D. Too far to walk: maternal mortality in context. *Social Science and Medicine* 1994; 38(8):1091-1110.



- (35) Kerber K, de Graft-Johnson J, Bhutta ZA, Okong P, Starrs A, Lawn J. The continuum of care: from slogan to science to saving the lives of mothers, newborns and children. Under review in *The Lancet*. 2007.
- (36) Lawn JE, Cousens S, Darmstadt GL, Martines J, Paul V, Bhutta Z et al. The Executive Summary of the Lancet Neonatal Survival Series. 2005.
- (37) Glasier A, Gulmezoglu AM, Schmid GP, Moreno CG, Van Look PF. Sexual and reproductive health: a matter of life and death. *Lancet* 2006; 368:1595-1607.
- (38) Cleland J, Bernstein S, Ezeh A, Faundes A, Glasier A, Innis J. Family planning: the unfinished agenda. *Lancet* 2006; 368:1810-1827.
- (39) Pariani S, Heer DM, Van AM, Jr. Does choice make a difference to contraceptive use? Evidence from east Java. *Stud Fam Plann* 1991; 22(6):384-390.
- (40) Rani M, Lule E. Exploring the Socioeconomic Dimension of Adolescent Reproductive Health: A Multicountry Analysis. *International Family Planning Perspectives* 2004; 30(3):110-117.
- (41) Khan KS, Wojdyla D, Say L, Gulmezoglu AM, Van Look PF. WHO analysis of causes of maternal death: a systematic review. *Lancet* 2006; 367:1066-1074.
- (42) Villar J, Ba'aqeel H, Piaggio G, Lumbiganon P, Miguel BJ, Farnot U et al. WHO antenatal care randomised trial for the evaluation of a new model of routine antenatal care. *Lancet* 2001; 357:1551-1564.
- (43) von Both C., Flessa S, Makuwani A, Mpembeni R, Jahn A. How much time do health services spend on antenatal care? Implications for the introduction of the focused antenatal care model in Tanzania. *BMC Pregnancy Childbirth* 2006; 6(1):22.
- (44) Pearson L, Larsson M, Fauveau V, Standley J. Childbirth care. In: Lawn J, Kerber K, editors. *Opportunities for Africa's Newborns*. Cape Town: Partnership for Maternal, Newborn & Child Health, 2006. pp.63-79.
- (45) Bell J, Curtis SL, Alayon S. Trends in delivery care in six countries. DHS Analytical Studies No. 7. Calverton, MD: ORC Macro and International Research Partnership for Skilled Attendance for Everyone (SAFE); 2003.
- (46) Bang AT, Bang RA, Reddy HM. Home-based neonatal care: summary and applications of the field trial in rural Gadchiroli, India (1993 to 2003). *J Perinatol* 2005; 25 Suppl 1:S108-S122.
- (47) WHO. *Pregnancy, Childbirth, Postpartum and Newborn Care: A guide for essential practice*. 2003. Geneva, WHO. *Integrated Management of Pregnancy and Childbirth (IMPAC)*.
- (48) Warren C, Daly P, Toure L, Mongi P. Postnatal care. In: Lawn J, Kerber K, editors. *Opportunities for Africa's Newborns*. Cape Town: Partnership for Maternal, Newborn & Child Health; 2006. 79-90.



- (49) Haines A, Sanders D, Lehmann U, Rowe AK, Lawn JE, Jan S et al. Achieving child survival goals: potential contribution of community health workers. *Lancet* 2007; 369:2121-2131.
- (50) Bryce J, Terreri N, Victora CG, Mason E, Daelmans B, Bhutta ZA et al. Countdown to 2015: tracking intervention coverage for child survival. *Lancet* 2006; 368:1067-1076.
- (51) Bhutta ZA, Darmstadt GL, Hasan BS, Haws RA. Community-based interventions for improving perinatal and neonatal health outcomes in developing countries: a review of the evidence. *Pediatrics* 2005; 115(2 Suppl):519-617.
- (52) Charpak N, Ruiz-Pelaez JG, Figueroa de CZ, Charpak Y. A randomized, controlled trial of kangaroo mother care: results of follow-up at 1 year of corrected age. *Pediatrics* 2001; 108(5):1072-1079.
- (53) Lim S, Adam T, Mehta S, Bhutta ZA, Fogstad H, Mathai M et al. Cost effectiveness analysis of strategies for maternal and neonatal health in developing countries. *BMJ* 2005; 331:1107.
- (54) Largo M, Liche A, Mumba T, Ntebeka R, van Rossmalen J. Postpartum health among rural Zimbabwean women. *African Journal of Reproductive Health* 2003; 7:41-48.
- (55) Thiede M, Akweongo P, McIntyre D. Exploring the dimensions of access. In: McIntyre D, Mooney G, editors. *The economics of health equity*. Cambridge: Cambridge University Press; 2007.
- (56) Borghi J, Hanson K, Acquah CA, Ekanmian G, Filippi V, Ronsmans C et al. Costs of near-miss obstetric complications for women and their families in Benin and Ghana. *Health Policy Plan* 2003; 18(4):383-390.
- (57) Evans DB, Adam T, Edejer TT, Lim SS, Cassels A, Evans TG. Time to reassess strategies for improving health in developing countries. *BMJ* 2005; 331:1133-1136.
- (58) Doherty T, Chopra M, Nkonki L, Jackson D, Greiner T. Effect of the HIV epidemic on infant feeding in South Africa: "When they see me coming with the tins they laugh at me". *Bull World Health Organ* 2006; 84(2):90-96.
- (59) Bulatao RA, Ross JA. Which health services reduce maternal mortality? Evidence from ratings of maternal health services. *Trop Med Int Health* 2003; 8(8):710-721.
- (60) Hussein J, Bell J, Nazzar A, Abbey M, Adjei S, Graham W. The skilled attendance index: proposal for a new measure of skilled attendance at delivery. *Reprod Health Matters* 2004; 12(24):160-170.
- (61) UNICEF. Stocktaking report on children and AIDS. 2007.  
[http://www.unicef.org/publications/files/ChildrenandAIDSAStocktakingLoResPDF\\_EN\\_USLetter\\_15012007.pdf](http://www.unicef.org/publications/files/ChildrenandAIDSAStocktakingLoResPDF_EN_USLetter_15012007.pdf) (Accessed 6 June 2007).

- (62) Knippenberg R, Lawn JE, Darmstadt GL, Begkoyian G, Fogstad H, Walelign N et al. Systematic scaling up of neonatal care in countries. *Lancet* 2005; 365:1087-1098.
- (63) Manongi RN, Marchant TC, Bygbjerg IC. Improving motivation among primary health care workers in Tanzania: a health worker perspective. *Hum Resour Health* 2006; 4(6).
- (64) Gwatkin DR, Bhuiya A, Victora CG. Making health systems more equitable. *Lancet* 2004; 364:1273-1280.
- (65) WHO. Commission on Social Determinants of Health. 2007. [http://www.who.int/social\\_determinants/en/](http://www.who.int/social_determinants/en/) (Accessed 6 June 2007).
- (66) Kaplan GA. Social Determinants of Health, 2nd Edition. M Marmot and R Wilkinson (eds). Oxford: Oxford University Press, 2006.
- (67) Population Reference Bureau. The Wealth Gap in Health. Washington DC, Population Reference Bureau, 2004.
- (68) World Bank. World Development Report 2006: Equity and Development. New York: The World Bank and Oxford University Press, 2005.
- (69) Gwatkin DR. The need for equity-oriented health sector reforms. *Int J Epidemiol* 2001; 30(4):720-723.
- (70) Costello A, Osrin D, Manandhar D. Reducing maternal and neonatal mortality in the poorest communities. *BMJ* 2004; 329:1166-1168.
- (71) Hart JT. The inverse care law. *Lancet* 1971; 1:405-412.
- (72) Ensor T, ve-Sen P, Ali L, Hossain A, Begum SA, Moral H. Do essential service packages benefit the poor? Preliminary evidence from Bangladesh. *Health Policy Plan* 2002; 17(3):247-256.
- (73) Mackenbach JP, Kunst AE. Measuring the magnitude of socio-economic inequalities in health: an overview of available measures illustrated with two examples from Europe. *Soc Sci Med* 1997; 44(6):757-771.
- (74) Filmer D, Pritchett LH. Estimating wealth effects without expenditure data--or tears: an application to educational enrollments in states of India. *Demography* 2001; 38(1):115-132.
- (75) Rutstein S, Johnson K. DHS Comparative Reports No. 6: The DHS Wealth Index. Calverton, MD: ORC Macro; 2004.
- (76) Gwatkin DR. Health inequalities and the health of the poor: what do we know? What can we do? *Bull World Health Organ* 2000; 78(1):3-18.
- (77) Wamani H, Tylleskar T, Astrom AN, Tumwine JK, Peterson S. Mothers' education but not fathers' education, household assets or land ownership is the best predictor of child health inequalities in rural Uganda. *Int J Equity Health* 2004; 3(1):9.

- (78) Sullivan JM, Bicego GT, Rutstein SO. Assessment of the quality of data used for the direct estimation of infant and child mortality in the demographic and health surveys. Institute for Resource Development, An Assessment of DHS-I Data Quality Demographic and Health Surveys Methodological Reports, vol. 1. Columbia, MD: Institute for Resource Development/Macro Systems; 1990. 115-139.
- (79) Curtis SL. Assessment of the quality of data used for direct estimation of infant and child mortality in DHS-II surveys. Occasional Papers, vol. 3. 1995. Calverton, MD, Macro International.
- (80) WHO. Expanded programme on immunization. 2006. <http://www.who.int/immunization/en/> (Accessed 6 June 2007)
- (81) ORC Macro. DHS StatCompiler. [www.statcompiler.com](http://www.statcompiler.com) (Accessed 6 June 2007)
- (82) Harvey SA, Ayabaca P, Bucagu M, Djibrina S, Edson WN, Gbangbade S et al. Skilled birth attendant competence: an initial assessment in four countries, and implications for the Safe Motherhood movement. *Int J Gynaecol Obstet* 2004; 87(2):203-210.
- (83) Gerein N, Green A, Pearson S. The implications of shortages of health professionals for maternal health in sub-saharan Africa. *Reprod Health Matters* 2006; 14(27):40-50.

## **Appendix 1: The Wealth Index**

Wealth indices can be used to assess disparities in specific demographic and health indicators. The wealth index in ORC Macro Demographic and Health Surveys is an indicator of the level of wealth that is consistent with expenditure and income measures that has been demonstrated to explain the same or a greater amount of the differences between households on a set of health indicators with less complex analyses.<sup>74;75</sup>

In the DHS wealth index, all household assets and utility services that will reflect economic status are included as indicator variables, including country-specific items. The greater the number of indicator variables, the better the distribution of households with fewer households being concentrated on certain index scores. There has been discussion of inclusion of additional items in the asset index (e.g. farm equipment, livestock, business equipment, financial assets, loans, land holdings and real estate, furnishings, clothing and jewellery, communications).

Household quintiles are not equally spaced in the assets scale, but they do represent equal-sized groups of households that can be compared over time and across different settings.<sup>75</sup> DHS uses quintiles instead of other percentiles as a compromise between limiting the number of categories to be tabulated and adequately representing the relationship between wealth and the phenomenon of interest. Though not available at the time of this study, ORC Macro/Measure DHS is currently calculating sampling errors for each quintile.

One of the limitations of the wealth index is that it only covers the household population. Not all people in a country are covered, especially some of the poor who may not be living in households or in dwellings.<sup>75</sup> Ascertaining the economic status of the non-household population is problematic, especially for the homeless, but they can probably be included in the lowest quintile. On the other hand, institutional populations, such as people in the army, hospitals, prisons, and orphanages, generally do not have access to health services available for the general population, but they may have access to specialized health services. There is also a need for a method for including internally displaced populations in countries where recent conflict has taken place. These people may not be included in analyses that cover the general population of the country but rather could be the subject of special surveys.

## Appendix 2: Stata regression output for Nigeria and Malawi

### Coverage

#### NIGERIA

```
. xi : logit ANC i.quintile
i.quintile      _Iquintile_1-5      (naturally coded; _Iquintile_1 omitted)
```

```
Iteration 0:  log likelihood = -2911.9192
Iteration 1:  log likelihood = -2494.3495
Iteration 2:  log likelihood = -2462.2443
Iteration 3:  log likelihood = -2458.632
Iteration 4:  log likelihood = -2458.5202
Iteration 5:  log likelihood = -2458.52
```

```
Logit estimates                                Number of obs   =      4453
                                                LR chi2(4)      =     906.80
                                                Prob > chi2     =     0.0000
Log likelihood = -2458.52                    Pseudo R2      =     0.1557
```

	ANC	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
_Iquintile_2		.1498655	.0924673	1.62	0.105	-.0313671 .3310982
_Iquintile_3		.7935345	.0945291	8.39	0.000	.6082608 .9788082
_Iquintile_4		1.709159	.1064518	16.06	0.000	1.500517 1.917801
_Iquintile_5		3.536957	.1970332	17.95	0.000	3.150779 3.923134
_cons		-.3114362	.0645322	-4.83	0.000	-.437917 -.1849553

```
. xi : logit SA i.quintile
i.quintile      _Iquintile_1-5      (naturally coded; _Iquintile_1 omitted)
```

```
Iteration 0:  log likelihood = -2990.6497
Iteration 1:  log likelihood = -2454.824
Iteration 2:  log likelihood = -2447.2019
Iteration 3:  log likelihood = -2447.1679
Iteration 4:  log likelihood = -2447.1679
```

```
Logit estimates                                Number of obs   =      4453
                                                LR chi2(4)      =    1086.96
                                                Prob > chi2     =     0.0000
Log likelihood = -2447.1679                    Pseudo R2      =     0.1817
```

	SA	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
_Iquintile_2		.4585299	.1170984	3.92	0.000	.2290213 .6880385
_Iquintile_3		.932724	.112731	8.27	0.000	.7117753 1.153673
_Iquintile_4		1.720802	.1101745	15.62	0.000	1.504864 1.93674
_Iquintile_5		3.287907	.1298266	25.33	0.000	3.033452 3.542363
_cons		-1.661559	.0870553	-19.09	0.000	-1.832184 -1.490934

```
. xi : logit PNC i.quintile
i.quintile      _Iquintile_1-5      (naturally coded; _Iquintile_1 omitted)

Iteration 0:    log likelihood = -3084.9942
Iteration 1:    log likelihood = -2718.6106
Iteration 2:    log likelihood = -2708.6899
Iteration 3:    log likelihood = -2708.5108
Iteration 4:    log likelihood = -2708.5107
```

```
Logit estimates                                Number of obs   =      4453
                                                LR chi2(4)      =      752.97
                                                Prob > chi2     =      0.0000
Log likelihood = -2708.5107                    Pseudo R2      =      0.1220
```

	PNC	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
_Iquintile_2		.1850266	.0968912	1.91	0.056	-.0048767 .3749299
_Iquintile_3		.6088169	.0959031	6.35	0.000	.4208504 .7967835
_Iquintile_4		1.212124	.0973102	12.46	0.000	1.0214 1.402849
_Iquintile_5		2.724105	.1285979	21.18	0.000	2.472057 2.976152
_cons		-.7532114	.0683328	-11.02	0.000	-.8871412 -.6192816

```
. xi : logit DPT i.quintile
i.quintile      _Iquintile_1-5      (naturally coded; _Iquintile_1 omitted)

Iteration 0:    log likelihood = -2521.2335
Iteration 1:    log likelihood = -2231.6103
Iteration 2:    log likelihood = -2217.0734
Iteration 3:    log likelihood = -2217.0135
Iteration 4:    log likelihood = -2217.0135
```

```
Logit estimates                                Number of obs   =      4453
                                                LR chi2(4)      =      608.44
                                                Prob > chi2     =      0.0000
Log likelihood = -2217.0135                    Pseudo R2      =      0.1207
```

	DPT	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
_Iquintile_2		.4039523	.1411521	2.86	0.004	.1272993 .6806052
_Iquintile_3		.7166416	.1360375	5.27	0.000	.4500129 .9832702
_Iquintile_4		1.415237	.1280035	11.06	0.000	1.164355 1.666119
_Iquintile_5		2.474404	.1278222	19.36	0.000	2.223877 2.724931
_cons		-2.179287	.1055046	-20.66	0.000	-2.386072 -1.972502

## MALAWI

```
. xi : logit ANC i.quintile
i.quintile      _Iquintile_1-5      (naturally coded; _Iquintile_1 omitted)

Iteration 0:    log likelihood = -2193.7033
Iteration 1:    log likelihood = -2142.4546
Iteration 2:    log likelihood = -2137.8891
Iteration 3:    log likelihood = -2137.73
Iteration 4:    log likelihood = -2137.7296
```

```
Logit estimates                                Number of obs   =      8700
                                                LR chi2(4)      =     111.95
                                                Prob > chi2     =      0.0000
Log likelihood = -2137.7296                    Pseudo R2      =      0.0255
```

	ANC	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
_Iquintile_2		-.0045693	.1141084	-0.04	0.968	-.2282177 .219079
_Iquintile_3		.2759494	.1190825	2.32	0.020	.042552 .5093469
_Iquintile_4		.7226567	.1399595	5.16	0.000	.4483411 .9969724
_Iquintile_5		1.620495	.2152578	7.53	0.000	1.198597 2.042393
_cons		2.258687	.084143	26.84	0.000	2.093769 2.423604

```
. xi : logit SA i.quintile
i.quintile      _Iquintile_1-5      (naturally coded; _Iquintile_1 omitted)

Iteration 0:    log likelihood = -5938.8174
Iteration 1:    log likelihood = -5645.9379
Iteration 2:    log likelihood = -5639.3777
Iteration 3:    log likelihood = -5639.3391
```

```
Logit estimates                                Number of obs   =      8700
                                                LR chi2(4)     =      598.96
                                                Prob > chi2    =      0.0000
Log likelihood = -5639.3391                    Pseudo R2      =      0.0504
```

	SA	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
_Iquintile_2		.0375742	.0669524	0.56	0.575	-.0936501	.1687985
_Iquintile_3		.2523823	.0661546	3.82	0.000	.1227217	.382043
_Iquintile_4		.6641798	.0700283	9.48	0.000	.5269268	.8014328
_Iquintile_5		1.77099	.0903995	19.59	0.000	1.59381	1.94817
_cons		-.1275224	.0493517	-2.58	0.010	-.2242499	-.0307949

```
. xi : logit PNC i.quintile
i.quintile      _Iquintile_1-5      (naturally coded; _Iquintile_1 omitted)

Iteration 0:    log likelihood = -5027.9797
Iteration 1:    log likelihood = -4847.2932
Iteration 2:    log likelihood = -4837.8584
Iteration 3:    log likelihood = -4837.7044
Iteration 4:    log likelihood = -4837.7043
```

```
Logit estimates                                Number of obs   =      8700
                                                LR chi2(4)     =      380.55
                                                Prob > chi2    =      0.0000
Log likelihood = -4837.7043                    Pseudo R2      =      0.0378
```

	PNC	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
_Iquintile_2		.2575384	.0706306	3.65	0.000	.119105	.3959718
_Iquintile_3		.3741344	.0704925	5.31	0.000	.2359716	.5122973
_Iquintile_4		.7474361	.0774051	9.66	0.000	.5957249	.8991472
_Iquintile_5		1.771696	.1099191	16.12	0.000	1.556258	1.987133
_cons		.5377622	.0510426	10.54	0.000	.4377204	.6378039

```
. xi : logit DPT i.quintile
i.quintile      _Iquintile_1-5      (naturally coded; _Iquintile_1 omitted)

Iteration 0:    log likelihood = -4064.5058
Iteration 1:    log likelihood = -4002.9825
Iteration 2:    log likelihood = -4001.2432
Iteration 3:    log likelihood = -4001.2377
```

```
Logit estimates                                Number of obs   =      8700
                                                LR chi2(4)     =      126.54
                                                Prob > chi2    =      0.0000
Log likelihood = -4001.2377                    Pseudo R2      =      0.0156
```

	DPT	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
_Iquintile_2		.154158	.080928	1.90	0.057	-.004458	.312774
_Iquintile_3		.2669174	.0811901	3.29	0.001	.1077878	.426047
_Iquintile_4		.5687297	.089657	6.34	0.000	.3930052	.7444542
_Iquintile_5		1.069729	.112274	9.53	0.000	.8496761	1.289782
_cons		1.202397	.0584236	20.58	0.000	1.087889	1.316905

## Co-Coverage

### NIGERIA

```
. xi : logit COC4 i.quintile
i.quintile      _Iquintile_1-5      (naturally coded; _Iquintile_1 omitted)
```

```
Iteration 0:  log likelihood = -2079.9801
Iteration 1:  log likelihood = -1778.3282
Iteration 2:  log likelihood = -1719.219
Iteration 3:  log likelihood = -1718.1503
Iteration 4:  log likelihood = -1718.145
Iteration 5:  log likelihood = -1718.145
```

```
Logit estimates      Number of obs   =      4453
LR chi2(4)          =      723.67
Prob > chi2         =      0.0000
Pseudo R2           =      0.1740
```

COC4	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
_Iquintile_2	.8373345	.2059819	4.07	0.000	.4336174	1.241052
_Iquintile_3	1.084571	.2005214	5.41	0.000	.6915558	1.477585
_Iquintile_4	1.955616	.1865466	10.48	0.000	1.589992	2.321241
_Iquintile_5	3.250025	.18215	17.84	0.000	2.893017	3.607032
_cons	-3.242381	.1675798	-19.35	0.000	-3.570832	-2.913931

### MALAWI

```
. xi : logit COC4 i.quintile
i.quintile      _Iquintile_1-5      (naturally coded; _Iquintile_1 omitted)
```

```
Iteration 0:  log likelihood = -6022.4249
Iteration 1:  log likelihood = -5709.7468
Iteration 2:  log likelihood = -5708.2355
Iteration 3:  log likelihood = -5708.2345
```

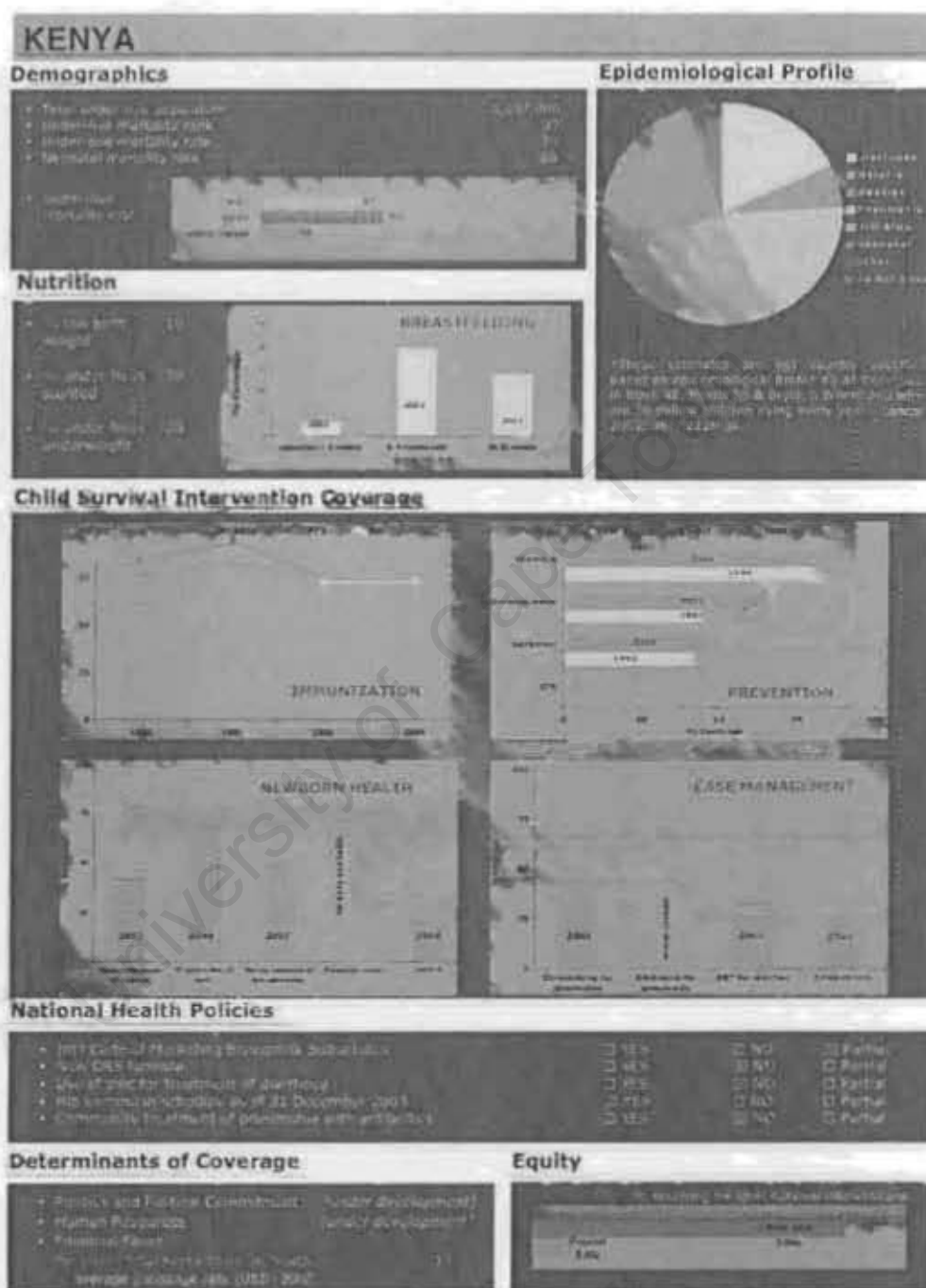
```
Logit estimates      Number of obs   =      8700
LR chi2(4)          =      628.38
Prob > chi2         =      0.0000
Pseudo R2           =      0.0522
```

COC4	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
_Iquintile_2	.1376618	.0690434	1.99	0.046	-.0023392	.2729845
_Iquintile_3	.2602995	.0678771	3.83	0.000	.1272609	.3933341
_Iquintile_4	.7420007	.0703106	10.55	0.000	.6041944	.8798069
_Iquintile_5	1.722521	.0830594	20.74	0.000	1.559727	1.885314
_cons	-.5691578	.0512593	-11.10	0.000	-.6696243	-.4686914



## Appendix 3: Examples of effective use of data for policy and advocacy

Example from *Countdown to 2015 Tracking Report*<sup>50</sup>



# Kenya



## BIRTHS, DEATHS AND INEQUITY

Total population	33,467,000
Annual births	1,322,000

### MOTHERS

Maternal mortality ratio per 100,000 live births	1,000
Annual maternal deaths	13,200

### BABIES

Stillbirth rate per 1,000 deliveries	45
Annual number of stillbirths	61,400
Neonatal mortality rate per 1,000 live births	33
Annual neonatal deaths	43,600
Excess NMR for poorest vs. least poor	32%

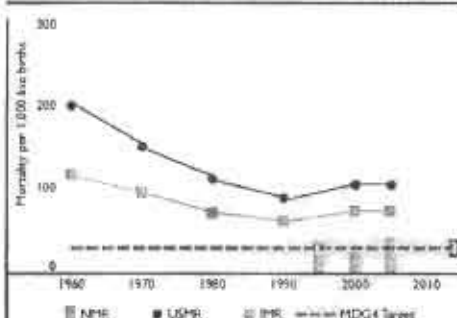
### CHILDREN

Under 5 mortality rate per 1,000 live births	120
Annual under 5 deaths	158,600
Annual postnatal deaths	115,000
NMR as percentage of USMR	28%

## POLICY AND IMPLEMENTATION

Stage (of 10) of Road Map	5
Establishment of national MNCH task force	Yes
Birth registration coverage	48%
Number of baby-friendly hospitals	232
Midwives per 1,000 population	-
Districts with IMCI	22%
Elimination of neonatal tetanus	No

## RATE OF PROGRESS TO MDG 4



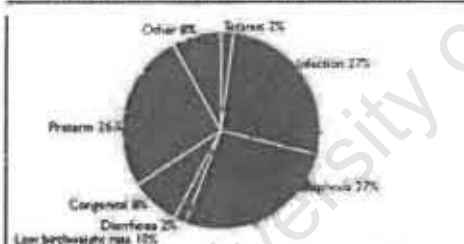
## IF 90% COVERAGE OF ALL ESSENTIAL PACKAGES

Newborn lives saved	up to 29,800
Range of NMR reduction	34-65%

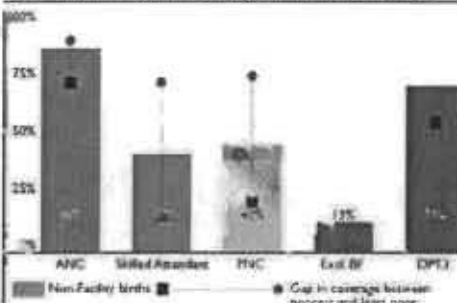
## FINANCING

Gross national income per capita (US\$)	\$460
Government spending on health, per capita (US\$)	\$8
Government spending on health	7%
Out-of-pocket spending on health	51%
User fee protection for women and children	Partial
Line item for newborns in national budget	-

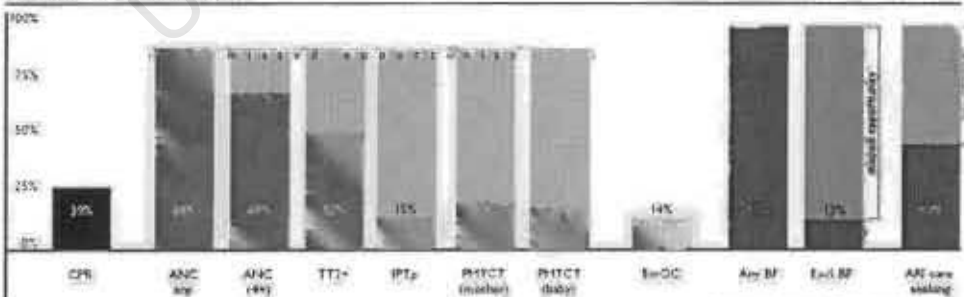
## ESTIMATED CAUSES OF NEONATAL DEATHS



## COVERAGE ALONG THE CONTINUUM OF CARE



## MISSED OPPORTUNITIES



Opportunities for Africa's Newborns

See notes on page 226 for details on ANC

University of Cape Town